

AGRICULTURAL RESEARCH INSTITUTE

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ANNUAL REPORT

THE DEPARTMENT OF AGRICULTURE

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Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the Crops and Markets Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—*The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.*

Conditions:

- (1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
- (2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
- (3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
- (4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor, Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

The Post-War Agricultural Industry.

Report of the Department of Agriculture for the year ended 31 August, 1946.

Dr. C. H. Neveling, Secretary for Agriculture.

A year ago a general feeling of optimism prevailed, for the six years of devastating war had just ended and the hope was cherished that our agriculture which had emerged from the war reasonably sound, would gradually revert to normal. But who could foresee what Providence had in store for us, and in our optimism we little dreamt that the ensuing year would be one of the most difficult ever experienced in the history of our agriculture. For the third successive year the country has been scourged by drought and none but our farmers know what it means to see their lands stretching out dry and barren before them, or sparsely covered with poor crops, to see clouds of dust moving over their veld and their animals reeling with hunger and thirst. How can we admire sufficiently the tenacity of purpose and perseverance of those courageous farmers who, seeing these pitiful sights, do not abandon hope and still have faith in the morrow?

The Food Position.

Once again the drought has taken a heavy toll and once more the farmer has been put to the test. But this year the drought held even graver implications for the country as a whole, for with such a serious world food shortage the country has, more than ever before, had to rely on home production for her food supplies. A poor wheat crop, followed by a drought in the maize belt, was one of the most serious misfortunes which could have overtaken the country. When the Food Mission went to London at the beginning of February to interview the Ministry of Food as our *buyers* and to submit our case to the London Food Board, the future was black indeed. Conditions were such that there was but little hope for any maize crop worth mentioning. The maximum quantity expected at that time was 12,000,000 bags.

Frost and cold were, however, late in coming (which may perhaps presage abnormal conditions for summer) and as many maize farmers risked planting late in summer, a crop was harvested which, under the prevailing circumstances, by far exceeded the most sanguine expectations. Crop estimates place the harvest at approximately 18,000,000 bags and this crop, together with the 4,000,000 bags which we were lucky enough to acquire from the Argentine, may be assumed to be adequate for satisfying the country's most pressing needs and for tiding her over her difficulties, provided that the supplies are husbanded.

In so far as wheat is concerned, the country was faced with an equally difficult position for, according to threshing-machine returns, this crop amounted to only, 2,800,000 bags, and as a heavier demand existed, this quantity together with the carry-over of barely 733,000 bags was wholly inadequate and consequently had to be supplemented, whatever the price. According to estimates, approximately

3½ million bags had to be imported, if distribution were to be maintained at a reasonable level. The final quantities allotted to the Union by the International Food Council were, however, much less, only 1,435,000 bags of wheat, 545,000 bags of flour and 23,340 bags of meal having been imported into the Union during the year under review. It stands to reason that the Department was obliged to apply the most stringent measures of economy in an endeavour to satisfy the country's needs out of the limited supplies, until the next crop which, fortunately, is very promising, becomes available.

The barley crop was most disappointing, the yield having been 180,000 bags less than that of the previous year, and recourse had to be had to restrictive measures and rationing, in order to ameliorate the position to some extent. *Inter alia*, no barley was allowed for animal fodder during the period December 1945 to the end of August 1946, but, nevertheless, 150,000 bags of barley had to be imported from outside the Union for feeding purposes. Of this quantity, 115,000 bags have already been received.

In the case of oats the quantity acquired by the Wheat Board was not even half the extent of the previous season's crop and, in view of the considerably heavier demand for this product, the Wheat Board was authorized to import 1,650,000 bags of oats by way of supplementing the local production. Of this quantity, 1,387,000 bags have already been landed.

In so far as both barley and oats are concerned, the 1945-46 season was a difficult one and the position was aggravated by the serious maize shortage which strongly affected the demand for these products. Hence, in fixing the prices, the feed value of barley and oats as compared with that of maize, was the deciding factor.

The rye position, on the other hand, was affected by the shortage of wheat, since rye bread is an acceptable substitute for supplementing the country's bread shortage. As in the case of the other winter cereals, the available amount of rye was also inadequate and the Wheat Board was granted permission to import 287,000 bags, of which 223,000 bags have already arrived. The restrictive measures which were made applicable to wheat and wheaten products, were also partially imposed in respect of rye and rye products.

The cereal shortage which has already obtained for a few years and which reached its nadir this year, is having a most serious effect on agriculture and is bound to leave deep traces behind. A gratifying increase in the feeds of livestock (cattle, pigs and fowls) took place during the war years—a fact which is indicative of improved farming methods and stability, but, unfortunately, the cereal shortage and the serious protein shortage threatened not only to hamper further progress, but also to nullify the progress already made. Naturally, the satisfaction of human needs is a primary requirement, and consequently, the feeding of animals had to be drastically curtailed. The dairy farmer, the pig farmer and the poultry farmer had to content themselves with the barest minimum for meeting their requirements. In view of the improvement in the maize position and in order to safeguard the fresh-milk supply of the cities, the ration for the urban fresh-milk producers was, however, slightly increased. It was not possible to make the same concession to producers of milk for industrial purposes or to pig or poultry farmers.

Rationing.

The serious shortage of food outside as well as within the Union, especially the shortage of wheat and maize, has compelled the Government to decide on the coupon-rationing system. The fact that

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this proposed rationing system has been placed under its own organization, separated from the Ministry of Agriculture, has given rise to considerable agitation amongst the farming population, since it is feared that the marketing and distribution functions of the boards of control under the Marketing Act will be affected thereby. The perspicuous statement of the Acting Prime Minister to the effect that the boards of control will continue to function under the Minister of Agriculture as in the past and that the Director of Food Supplies and Distribution will exercise a general direction only, in respect of the distribution of products under the control of the boards has, however, induced farmers to view the matter in its true perspective. Moreover, the temporary nature of the emergency measure has been repeatedly emphasized by the Government.

The difficult position created in the Union in so far as its food supply is concerned, by the drought, had a salutary effect inasmuch as the city-dweller and the farmer have been brought closer together. The city-dweller has realized that the farmer is powerless against Nature, that even his utmost efforts at production may be of no avail and that his existence is a most precarious one. The farmer, on the other hand, has felt the greatest sympathy for the urban housewife who has had to stand in queues to secure the family's food requirements.

Reconstruction of Agriculture.

Although, from a production point of view, the year was most abnormal, considerable progress has been made in regard to the reconstruction of agriculture and during the past year the foundation has been laid for a sounder, more stable and more prosperous industry. At the beginning of the year the Government announced its policy in respect of agriculture in a "White Paper". This document should be in the hands of every farmer, and the leaders of the farming community, in particular, should study its contents carefully. The main theme of the White Paper is a plea for conservation farming and economic stability, the only means of achieving a sound and efficient agriculture, capable of contributing towards a higher standard of living and an improved nutrition for the nation as a whole.

The White Paper briefly outlines the proposed programme of action envisaged for developing agriculture to a high level of efficiency and utility and maintaining it at that level. It aims mainly at:—

- (1) Encouraging the general practice of conservation farming at an early date, in order to protect and build up our soil, water and useful vegetation; and
- (2) enhancing the productivity of our farming by raising the educational standard of the farmer, encouraging more modern farming methods, raising the efficiency, and so also improving the standard of living of farmers and their labourers, promoting price stability, ensuring a market for the increased production required for better national nutrition, and making better transport and auxiliary services available.

Conservation farming is not merely a synonym for soil-erosion control. We must discard the idea that conservation farming consists merely of the application of soil-erosion control measures, for it has a far wider scope and the malpractices, which have to be eliminated, are extremely deeply rooted. The present piracy farming systems have to be superseded by a new approach aiming at the reclamation of our vegetal cover, and the restoration of our soil

and water resources. The key to conservation farming lies in the employment of our farming systems in such a way that they link up with natural conditions in order that the basic causes of erosion, denudation, exhaustion and loss of water can be eliminated. The soil-improvement aspect cannot be sufficiently strongly emphasized for only along this road can farming in our country, with its poor, easily eroded soils and variable climate, be stabilized.

Agricultural Legislation.

In giving effect to the policy as set out in the White Paper, the Government enacted during the last Parliamentary session a number of agricultural laws designed to promote agriculture. These laws testify to the serious attitude towards this matter on the part of the Government and the Department and comprise the Wool Act, the Soil Conservation Act, the Livestock and Meat Industries Act Amendment Act and the Amendment to the Marketing Act.

The *Wool Act* gives stability to the most important agricultural product of the Union. Wool is such an important farm product that the stabilization of its price exercises a beneficial influence on many other branches of agriculture. A penny per lb. rise in the price of wool means an increase in the income of the country of £1,000,000 and it has often been said, and not without some truth, that the price of wool can be regarded as a barometer of the welfare of agriculture.

The past year has witnessed a big change in the wool position. Due to the drought in Australia, and to some extent also to the fact that the accumulated stocks of South African wool were representative of our clips, the Union has disposed of very large quantities of wool during the past wool year. Whereas at the time of the London Wool Conference last year the stocks on hand in the Union comprised more than 2,000,000 bales, they now amount to barely a quarter of this figure. We should, however, guard against being lulled into a false sense of security by this state of affairs. True, the wool has been sold, but it has not yet been used, and may still affect future prices. In addition, both Australia and New Zealand still have considerable quantities on hand.

The favourable turn of the sales has considerably lightened the financial burdens of the Union and consequently also of the wool farmers under the Wool Disposal Scheme. Unless local organization is obliged, through the trend of affairs, to absorb large quantities of wool at the reserve price—and this does not seem likely—the capital expenditure, interest and storage costs will be much less than the figure estimated by the Conference. The effect is already reflected in the lower levy of $7\frac{1}{2}$ per cent. instead of the 13 per cent., estimated earlier. The levy of $7\frac{1}{2}$ per cent. is perhaps still somewhat high but in considering the figure, it was felt that it would be preferable to build up a fund during the first year, rather than demand high contributions from farmers later, when conditions may perhaps not be as favourable.

The *Soil Conservation Act* creates the framework for the improvement of our farming systems and methods, for the restoration and improvement of our soil fertility and for the raising of productivity. The agricultural organizations were consulted step by step on this important legislation, through the Agricultural Advisory Council, and the representatives not only made a constructive contribution towards the measure, but also promised their full support.

The framework has been established, and it now rests with the farmer to make use of it, with the assistance offered by the

Department. The Soil Conservation Board will shortly be constituted when the machinery under the Act will be ready for operation. Farmers themselves should take the initiative. The State will supply financial assistance and the Department technical guidance, but the main task will rest with the farmers themselves. It is a serious task, this task of conserving, improving, and safeguarding the soil for posterity. It is a long process calling for perseverance and courage, for disappointments will not be lacking, and above all, it is a task calling for close co-operation. The individual alone will not be able to effect much, but the concerted action of a group will even change a desert into a paradise.

The *Livestock and Meat Industries Act Amendment Act* is not important in itself, but it constitutes part of the larger whole of the increased productivity of improved farming. An improvement of the arable land and of the grazing should go hand in hand with livestock improvement.

Much has been achieved during the past decade by the application of this Act, but in the programme of reconstruction, livestock will have to play a more important rôle than ever before and, with due regard to the limitations imposed by specific natural conditions, the aim should ever be for improvement.

The much-discussed *Marketing Act Amendment Act* led to a great deal of misunderstanding. For this reason the Government has decided that a select committee of Parliament should investigate the operation of the Act next year in the light of the reports of the Marketing Council and the Distribution Costs Commission. It can only be hoped that the investigation will end all misunderstanding and that light will be thrown on the actual aims and objects of the Control Board system.

The chief aim of the amendment was to render it possible to place the Meat Scheme permanently under the Marketing Act. The Meat Scheme has not been transferred to the new organisation of the Director of Food Supplies and Distribution, but will remain under the Minister of Agriculture and will be administered in closest contact with the Department. Only after the report of the Marketing Board on the scheme has been received, will further consideration be given to its incorporation under the Marketing Act. *The year 1946 will stand out as a landmark in the history of the Agriculture of this country.* When the present shortages of food and animal fodder have long been forgotten, the year 1946 will still be remembered as the precursor of the new era in which our farming was placed on a sound footing, marking the beginning of efficiency and prosperity.

What of the Future?

In considering the more immediate aspects, the production trends of the coming season and of the future, it may be mentioned that authorities on the international food position are of the opinion that it will take at least two crop years before the present cereal shortage can be supplemented by world production and that, in so far as animal products are concerned, it may even take as long as 4 years. What are the implications of this world position in so far as our agriculture is concerned, and how must we organize our agricultural production so as to ensure the maximum services to the country from a national point of view?

Briefly, the emphasis must be laid on cereal production for at least another year. Animal products, on the other hand,—meat dairy products, eggs—are assured of a good market for the next four or five years. In these circumstances, the chief developmental

trend need not be retarded by a too small demand. If there is no local market for all the animal products—and under modern nutritional tendencies there is still scope for further expansion before this stage will be reached—foreign markets will absorb them all.

Cereal production, either as concentrates, silage or green feed, also forms the basis of a sound livestock industry. Although unsuitable land had to be used during the war years for the production of concentrates and although the soil fertility was exhausted and will seriously hamper future reconstruction, it nevertheless does not represent a dead loss to agriculture. Large areas of these lands are capable of being used for fodder production and will facilitate the keeping of more livestock in our farming concerns. The further emphasis on increased grain production, unfortunately, has the disadvantage that for another year less attention will be paid to the expansion of our livestock population. Consequently, the Department is anxious that we should keep our livestock population at its present level at least, and the Department itself will do everything in its power to maintain the livestock industry until the dawn of better times, in spite of the critical grain position obtaining in the world to-day.

If the Union cannot at present be self-sufficient as regards cereals for the nutrition of its population, the question arises as to where the country will in future obtain sufficient cereals for the feeding of its animals. In this respect, however, an optimistic outlook is justified, for we should not lose sight of the fact that our agricultural potential has been enormously increased during the past four or five years, although the total yields were not always maintained at the same level. Moreover, we should not forget that agriculture has suffered severely and is still suffering as a result of a shortage of instruments of production such as fertilizer, agricultural implements and machinery, as well as labour. Should the Union have sufficient of these three essential instruments of production at her disposal and experience a good season, the yield may yet be the source of a pleasant surprise to us.

Fertilization is a most important factor in the achievement of higher and more profitable yields, but it has been contended that agriculture has been as seriously hampered during the past few years by a shortage of machinery and labour as by a shortage of fertilizer. The shortage of labour may be partially remedied by the use of more and effective labour-saving machinery and it is in this respect that *our* agricultural industry has been particularly restricted. In spite of labour shortages in the farming industry, the agriculture of the United States, and even that of England, broke world records in respect of their crops because they had free or almost free, access to agricultural machinery. England's traction power has expanded phenomenally and the figures for farm machinery for the U.S.A. show an even more striking rise.

Last year it was hoped that the Union would be reasonably well supplied with agricultural implements and machinery by the second half of the year, but strikes in America have frustrated this hope. The supply is gradually improving and it would appear that by next year the most urgent requirements will have been met.

Farm labour still furnishes a serious problem. During the war years extensive use was made of the services of Italian prisoners-of-war, but the repatriation of the prisoners-of-war is contemplated, and although this loss of labour can be partially remedied by labourers who have been demobilized from the armed forces, it is still necessary for our farmers to form a clear idea of the labour

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position of the future. The questions arise as to whether agriculture will again have such a plentiful supply of labour at its disposal as in the past, or whether the farming concerns will have to adapt themselves to the changed circumstances, and whether more machinery will have to be imported or the available labour utilized more effectively. Under stress of circumstances, South-African agriculture developed historically on the basis of the labour supplied by the unskilled and often uncivilized native. In the nature of things, the industry could hardly reach a higher level of efficiency than that permitted by its labour. In this respect one is reminded of the nick-name "kafferboerdery" of which, unfortunately, too many instances still abound.

During the following two decades it will be *imperative* to raise our labour efficiency in farming, if our soil-conservation programme is to be carried out and the productivity and net revenue from our agriculture increased. The time has come for a more intensive concentration on the training of farm labourers. Training schools where natives, and even coloureds, can be trained for farm work will not only be a boon to agriculture but also a national asset.

The European farmer is not above criticism in this respect. Insufficient knowledge of farming practices and of the inter-relationship between the plant and nature is a big contributory factor in the decline of our agricultural production to the low level on which it finds itself to-day. The raising of the general standard of education of the country districts and a better knowledge of the scientific basis of agriculture are prerequisites of advancement.

Grain Bags.

The supply position as regards grain bags and also wool bags is far from reassuring. It is expected that sufficient bags will be available for the present maize crop and the coming wheat crop, but the same cannot be said of next year's crop. The fact that we are faced with a most serious problem is fully appreciated and strenuous efforts are being directed at remedying the position. Control of jute goods has been re-introduced and drastic measures will be necessary for ensuring that bags are saved and their lives lengthened. The urban consumer who ultimately receives these bags can do much towards ensuring that no bags are wasted and that every empty bag is returned to the producers.

As a result of the smaller jute crop and the increased demand since the end of the war, a world shortage of bags has arisen. Since the Union cannot obtain stocks direct from India, the country has no option but to endeavour to obtain second-hand bags from other countries. Every effort is being made to accomplish this and any usable bag, irrespective of its size, is acquired. As a result of the general scarcity, many countries, have, however, imposed restrictions on the export of jute goods and consequently free purchases cannot be made.

From the above it is evident that the Union will have difficulty in securing her requirements. Consequently the processing of fibres obtained from our own production and from neighbouring states, is a matter which is at present receiving serious attention. The planting of fibre plants is confined to certain areas but the production can nevertheless, be considerably increased. The shortage of bags has unfortunately been aggravated by the shortage of paper containers which in many cases can be utilized as substitutes for jute bags.

Consideration is naturally also being given to the possibility of easing the problem by rendering bulk storage-space available.

Protein-rich Foodstuffs.

Since the quantity of feed given to animals has increased to such an enormous extent and since animal feeding plays such an important rôle in the production of protective foods, the lack of adequate proteins for use in balanced rations has resulted in a most serious position.

In 1939 the consumption of balanced nutrients amounted to approximately 12,000 tons, representing a value of about £10,000, whereas in 1945 it increased to about 248,000 tons, and the consumption for the year under review is estimated at 300,000 tons, with a corresponding value of about £3,500,000.

Proteins.—On the basis of the consumption during the past few years, the annual requirements of protein-rich foodstuffs amount to about 75,000 tons. Of these about 60,000 tons represent vegetable proteins of which more than 90 per cent. have to be imported, and 15,000 tons, animal proteins, of which about 33½ per cent. have to be imported.

As a result of the world shortage of oil-bearing seeds and the fact that we will be able to obtain a small portion of our requirements only by importation, strenuous efforts are being made to effect as large an increase as possible in the local production of groundnuts. The groundnut has a very high oil content—the demand for which is heavy—and yields the valuable oil-cake which enjoys such a wide market.

Under the stimulus of the Department, which is referred to elsewhere in the report, the groundnut crop increased to a quantity estimated at 250,000 bags, as against 120,000 bags in 1945, and the Department is endeavouring to induce farmers to plant for the next season at least 20,000 bags of groundnut seed, which quantity is capable of producing an estimated crop of 25,000 tons, of which approximately 18,000 tons can be utilized for the production of oil and oil-cake.

Bonemeal. The quantity of bonemeal produced locally during the year amounted to 23,938 tons, which amount represents an increase of 3,000 tons on the production of the previous year, but against this, our annual requirements are at present about 35,000 tons. The available supplies are therefore wholly inadequate, but it is hoped that the improvement which has been effected in the transport facilities will result in a larger collection of bones and an increase in the production of bonemeal. The prohibition of the utilization of bonemeal as a fertilizer still remains in force and the manufacturers of feed mashes also have to use imported bonemeal for their products.

As a result of the serious shortage in respect of protein-rich nutrients, bonemeal and animal licks, the Department was compelled to take special steps, as in previous years, for obtaining supplies and for distributing available supplies on as equitable a basis as possible.

Fertilizer.

During the past 12 months the demand for fertilizer once again far exceeded the available supplies and the serious shortage of this indispensable requirement necessarily had a hampering effect on the production of food. Actually, the demand has increased as a result of the appeal for increased production and also as a result of the return of so many of our farmers who served in the armed forces.

True, there was an improvement in the phosphate position, but owing to the increased number of applicants for whom provision had to be made, the basic quota per morgen could not be increased.

Supplementary grants were, however, made in special circumstances, e.g. in cases where it was deemed necessary to encourage increased production of maize, wheat and other essential products.

The Government is making every possible effort to obtain additional supplies, but present indications are that a general improvement of the position cannot be expected in the near future. There are two factories in our country which are at present converting rock phosphate into superphosphate, and a third is under construction. The maximum production of the two existing factories is approximately 300,000 tons per annum. It is not expected that any considerable improvement will take place before the third factory has reached the production stage.

The control of fertilizer is being continued and the Controller of Fertilizer had a quantity of some 283,000 tons of superphosphate and 18,000 tons of Gafsa rock phosphate from Egypt available for distribution.

Due to shortage of fertilizer, a big demand for Karroo manure and other manures arose, and it was found necessary to fix prices and to prescribe conditions of transport on account of the large dimensions of the trade.

The following prices have been fixed for fertilizer as from 1 July 1946:—

<i>Kind of fertilizer.</i>	<i>Maximum price per 2,000 lb. (in bags).</i>		
	£.	s.	d.
Superphosphate 19 per cent.	7	8	0
Superphosphate 18 per cent.	7	7	0
Superphosphate 17·1 per cent.	6	13	0
Superphosphate 15·1 per cent.	5	18	0
Rock phosphate and Superphosphate-mixture ...	5	18	0
Calcium chloride ...	23	7	6
Ammonium sulphate ...	20	0	0
Ammonium phosphate ...	23	5	0

These prices are quoted f.o.r. seller's station and farmers receive a subsidy of £1 per ton. For quantities of less than 2,000 lb. but not less than 200 lb., the prices must be in proportion to the price per ton.

In the case of kraal manure, mixed manure and agricultural lime, the following prices were fixed as from 25 January 1946:—

<i>Kind of manure.</i>	<i>Per 2,000 lb. free on rail sender's station.</i>
	s.
Crude kraal manure ...	14.
Sifted kraal manure ...	16.
Ground kraal manure ...	30.
Crude compost ...	16.
Sifted compost ...	30.
Agricultural lime ...	20.

These prices do not include the price of the bags and when the manures are sold in bags, the prices of kraal manure and compost may be increased by 1s. per bag and those of agricultural lime by 10s. per ton.

Weed Control.

The control of weeds is closely related to the whole problem of soil conservation and veld improvement and the steps taken in this direction were crowned with a considerable measure of success in almost all spheres and in respect of most proclaimed weeds. Only in isolated cases did the Department find it necessary to give assistance for the eradication of weeds along the river banks, but it is hoped that this service will be withdrawn in the near future.

The eradication of weeds nevertheless continues to be an uphill struggle and there appears to be no justification for relaxing the measures for the control of this evil. The Department welcomes the representations made from time to time for a stricter application of the provisions of the Weed Act and the reorganization and extension of the field services of the Department are also directed at more effective weed control.

The eradication of the prickly-pear pest has now reached a stage where the discontinuation of the two schemes which were put into operation in the biological area and which were dealt with in last year's report can be contemplated. In this area, originally estimated at 1,000,000 morgen, the cactoblastis, and later the cochineal insect, were released, but in order to assist the latter insect in its process of destruction, it was decided to chop down the prickly pears and to leave the work of destruction to the cochineal insect. It is estimated that when the scheme has finally been concluded in the biological region, an area of approximately $\frac{3}{4}$ million morgen will have been treated in this manner.

The desirability of also granting State assistance for the destruction of prickly pear to certain areas outside the present biological area in those cases where the infestation will justify the employment of the departmental scheme is, however, being considered.

The activities of the Department in the field of weed eradication are gradually expanding and the eradication of bush is already being undertaken on a large scale in Zululand, where valuable experience is being gained, which can at a later date be applied in other areas where the problem of bush encroachment has arisen. Work in this connection is being seriously hampered by lack of heavy implements, but as more machinery becomes available, the work is carried out more rapidly and more effectively.

A contract has recently been concluded with a private company for the employment of tractor-driven machinery by way of an experiment, for the eradication of tree stumps, and if the experiment proves a success, the Department will consider the possibility of having this work done by private enterprise under contract.

Locust Destruction.

During the year under review no destruction campaigns were undertaken by the Department, either in the Union, South West Africa or the Bechuanaland Protectorate against hoppers of the brown locust or red locust. The Union, however, assisted with the destruction of extensive outbreaks of the red locust at Lake Rukwa in Tanganyika Territory.

The Brown Locust (*Locustana pardalina* Wlk.).

As forecast in the previous annual report, no incipient hopper outbreaks occurred during the first half of the summer season and, as a result of the protracted drought which continued well into the second half of the summer in most of the outbreak districts, the solitary-phase population remained at a low level throughout the greater part of the country.

In parts of some districts, however, sufficient rain fell during January, March and April to bring about a rapid increase of the solitary phase, with the result that the solitary flier population reached a critical density in parts of nine Karoo districts before the winter set in, and prevented further breeding. From this it is concluded that incipient hopper outbreaks may be expected with the first general rains of the coming summer in the following districts:—Hanover, De Aar, Richmond, Phillipstown, Colesberg, Hay (Griqua-

town), Hopetown, Fauresmith and Jacobsdal. If the later summer rains are adequate, infestation may spread to other districts before the winter.

Small-scale *gregaria* hatchings occurred on two old nests, one in the Warmbad district, South West Africa, where about thirty small swarms were destroyed by the farmers themselves, and the other on a two-year-old nest in Kenhardt, Cape Province, where the hoppers were destroyed by birds. Small hatchings of an incipient nature occurred in the northern part of the Calvinia district during November, on a narrow strip where an isolated shower of rain had fallen. In this instance the hoppers died of starvation as a result of the severe drought conditions.

The prospects for the coming season are that extensive incipient hopper outbreaks will occur in the nine districts mentioned, and that infestation will increase considerably during the second half of the summer if climatic conditions favour the breeding of later generations.

The Red Locust (*Nomadacris septemfasciata* Serv).

No swarms of this species occurred in the Union, South West Africa or the Bechuanaland Protectorate during the period under review.

Surveys during May and July, 1946 established the presence of solitary phase red locusts in Swaziland and the northern coastal belt of Natal. During the 1944-45 surveys none could be found and it is therefore not certain whether the locusts discovered in 1946 are the progeny of some that escaped detection during the previous surveys or whether their parents entered the Union in scattered formation during the 1945-46 season without being reported. A very small number of solitary-phase locusts were also found in some of the swampy areas of the Bechuanaland Protectorate in July 1946. Surveys will have to be continued to ascertain with certainty whether there are any potential outbreak centres of the red locust in the Union or Bechuanaland. The numbers of *solitaria* found in these latest surveys are very small and there is certainly no immediate threat, if any, to the Union from this source.

At Lake Rukwa, in Tanganyika, the International Red Locust Control Service carried out a successful campaign against an extensive incipient outbreak of this species. Although not yet a member of this Service, the Union contributed £10,000 and made available the services of an Entomologist and a Senior Locust Officer to assist in this valuable work. As a result of the large measure of success attained through this campaign, the beginnings of a new swarming cycle have been prevented and the Union need not fear a long series of invasions such as those experienced between 1933 and 1944. The experience gained during the last campaign at Lake Rukwa indicates that future incipient outbreaks can be controlled with equal success and there is now every hope that invasions of Southern Africa by red locust swarms can be entirely prevented in the future by this system of preventive control in the outbreak area of the species.

A few swarms of fliers, probably the tail-end of the last swarming cycle, have been reported from the southern parts of Angola during the past winter months. Although it is considered unlikely that these swarms will have sufficient momentum to invade the Union, it is hoped that the International Service will be in a position to attack their progeny and so remove any threat to Southern Africa from this source as well.

The expenditure incurred by magistrates in locust destruction amounted to approximately £5,000.

Research.

The practical approach to a large number of our problems must necessarily be effected through the medium of research and experimentation and, although striking results have been achieved in this field, there are still numerous problems awaiting elucidation and solution.

It is not by mere chance that the Department has founded some 20 research stations in various areas, but because it is deemed essential to investigate local problems locally. It is realized that this number of research stations is not sufficient for the investigation of all regional problems locally and last year a Committee was appointed to report on the desirability of erecting more strategically situated research stations. Besides these 20 stations, the 5 colleges of agriculture are also centres of research. It is intended to extend the research stations, but the rate of development is contingent on the availability of the necessary technical staff.

The research work of the Department is mainly concentrated on the production and the development of farming systems which are adapted to regional requirements. From its very nature it must cover a wide field and this work includes, *inter alia*, the cultivation and selection of plants which adapt themselves to specific climatic conditions, the development of veld and grazing practices for specific conditions, the determination of cultivation methods designed not only to maintain and improve soil fertility but also to increase the yield per unit of soil and, finally, the development of the right kind of animal, suited to the environment and best able to utilize the farm products economically. In addition to this we have the essential supplementary work in connection with livestock diseases, plant diseases and agricultural pests.

Full particulars in regard to the research and experimental work are given in the reports of the Divisions. This work covers the extensive field of agriculture in its entirety and includes much fundamental research calling for years of patient labour, before final results can be achieved.

The Department and the country can only express their gratitude towards the band of research workers—a group which unfortunately, is still all too small—who are straining every nerve to find a solution, along scientific lines, to the country's manifold problems.

Some universities also undertake agricultural research work on a limited scale, but there is still room for expansion and a closer relationship between the universities and the research activities and research stations of the Department, is exceedingly necessary. The research strength is so limited and the field so extensive that everyone capable of contributing his share, should be engaged in a concerted effort at tackling the problems besetting the agricultural industry.

Extension Work.

The extension service of the Department is steadily expanding, particular importance being attached to personal contact with the farming community. The aim is, as more qualified candidates are appointed, gradually to subdivide the area served by each extension officer into smaller units, since the present size of the various areas is not conducive to intensive service. The extension services constitute the means by which the Department popularizes the results of research and experimentation, and tested systems and practices, among individual farmers, and the task of maintaining the necessary contact devolves on the extension officer. The intention is that the farmer should find in the extension officer a true friend and adviser.

During the past year the extension officers devoted much of their time to co-operative demonstrations on private farms; these demonstrations proved a signal success and were invaluable not only to the farmer but also to the Department which obtains useful data through these sources.

The system of whole-farm demonstrations or demonstration farms, too, has expanded considerably and these demonstration farms are now to be found in 20 different regions. During the past year another 7 farms were used for demonstration purposes. Whereas co-operative demonstrations demonstrate certain aspects of farming only, the whole-farm demonstration is designed for the demonstration of a suitable farming system for the area in which the farm is situated. This is done with the full consent and collaboration of the owner.

In addition to the extension officers, the Department employs home-economics officers, who bring to our rural homes the benefit of their knowledge and experience. In many cases they have already succeeded in arousing interest in those very things which make farm life happy and attractive. Theirs is the task of stimulating fresh interest in the housewife, as her interest contributes in no small measure towards the effecting of economy in household matters and the raising of the nutritional standards. The home-economics services constitute an integral part of the extension services for the country districts.

No less important than the services of the extension officers and home economics officers for maintaining personal contact, are the agricultural clubs and land service. The training of the youth to the realization that farming requires a high degree of skill, and the inculcation into the child and youth of a predilection for farming is perhaps one of the main steps which can be taken for stabilizing the agricultural industry of the future. Already these institutions have some remarkable achievements to their credit and they have often performed services in the interests of the whole community.

The Department also endeavours to establish contact with our farmers through the medium of the radio, the agricultural film service, the facilities offered by the agricultural library, the press service, the agricultural bulletins and the monthly publication, *Farming in South Africa*. The radio is an innovation in the field of agricultural education but proved very popular during the war years. Up to April 1946 only three talks were delivered weekly, but in collaboration with the South African Broadcasting Corporation, a better arrangement has been made, and agricultural items are now broadcast at a more suitable hour. No longer are they limited to the somewhat dry talks of yore, but the information is now presented more attractively and includes conversations, interviews, etc.

Education.

It has already been stated that farming, with its numerous problems, is gradually making heavier demands on those who practise it and that agricultural education is, for that reason, of the utmost importance to the agricultural industry.

The agricultural faculties of the universities of Stellenbosch and Pretoria and the 5 colleges of agriculture are offering a service in this respect which cannot be valued too highly. The creation of a faculty of agriculture at the Natal University College in Pietermaritzburg, which has already been decided upon, is being awaited with interest and will be another milestone in the establishment of facilities for agricultural education.

The faculties are the institutions whose task it is to satisfy the ever-increasing demand for qualified agriculturists for all the branches of the agricultural industry; the colleges of agriculture, on the other

hand, supply those trained farmers, who are so essential to the agricultural industry which has to satisfy growing demands, and which, in turn, is ever making heavier demands on farmers. The colleges of agriculture also produce trained persons who are capable of acting as foremen on farms and who are also qualified for appointment as managers in creameries and cheese factories as well as in other capacities. These colleges have already made their mark, and some of their old students are to-day occupying important posts, while others are playing leading rôles as progressive farmers.

The post-war reintroduction of the diploma course, other regular courses and special short courses at the colleges of agriculture at the beginning of 1945 is an event of national importance and the number of enrolments testify to the present need for this type of training and the popularity of the various courses. There was a time when the colleges of agriculture failed to draw sufficient numbers of students and, although the number of registrations has gradually increased since the introduction of the Two-year Diploma Course before the war, 1946 is the first year in which the colleges were compelled to refuse applicants admission.

In enrolling students for 1946, preference was given to ex-volunteers, and in all cases the maximum number was accepted, and no Union ex-volunteers in possession of the necessary qualifications were refused admission. All vacancies at Cedara for both 1946 and 1947 have been booked by ex-volunteers.

Since our colleges of agriculture in the Union offer courses which, to some extent, are also adapted to conditions prevailing in the adjoining territories they are also the obvious institutions upon which those territories have to rely for the agricultural training of their citizens. Consequently, facilities have been created for the admission of a limited number of students from these territories to courses offered by the Colleges.

Personnel.

From this report as well as the Divisional reports, it can be seen that the shortage of staff, mainly of professional officers, had a hampering effect on the extensive activities of the Department, in some cases even to such an extent, that certain research activities either had to be temporarily discontinued, or cut down. Since the agricultural industry is continuously waging war against the multiplicity of stock diseases, insect pests, and plant diseases, and is ever endeavouring to solve production problems the question of an adequate and well-equipped staff is a matter of the outmost importance.

The number of qualified candidates offering their services is entirely inadequate to satisfy the abnormal demand from both the state and private employers and, although the Department is making every effort to establish better facilities for the training of agriculturists, there is not much hope for any considerable improvement in the position in the near future.

Agricultural Research for Greater Production.

For victor and vanquished alike the termination of hostilities has brought little or no relief in so far as food supplies are concerned.

South Africa is no exception and the position in our country is such that it has been found necessary to call into being a Directorate of Food Supplies and Distribution, whose function it is to ensure that the limited supplies of many of our essential foods are so distributed that every person—no matter what his financial position—receives a fair share of the commodities in short supply.

It is not only in total quantities or calories that there is a lack, but also in the quality of the food, for our nutrition scientists are adding almost daily to the lists of essentials for an adequate diet that must be provided for a reasonable standard of health.

The result is that those concerned with the production of food, our farmers, are being called upon not only to provide the calories in the form of more cereals, like maize and wheat, but also more of the so-called protective foods which contain the vitamins, the minerals and the proteins essential to health.

Furthermore, the position in regard to food has assumed a new aspect as a result of the acceptance by practically all nations of social



Farm in harmony with Nature. Beef cattle on well-preserved veld in northern Transvaal.

security plans which not only envisage better housing, fuller employment and better wages, but also better health and better living standards. Emphasis is being laid, too, on preventive medicine. All these will stimulate the demand for food, particularly for the protective and concentrate foods such as fruit and vegetables, dairy products, meat and eggs, and the fundamental problem is how to provide these in sufficient quantity.

The discovery in the Orange Free State of new gold fields rivalling those of the Rand and the industrial expansion that is evident on every hand will make still further demands on our farmers for food.

It may seem strange, but it is nevertheless true that every fresh demand for protective foods results in an increased drain on our principal cereal crop, maize, already the staple food of our native population. If we are to answer this call for more and better quality food, then special attention must be given to increased maize production.

Only about 15 per cent. of the land area of the Union is suitable for arable purposes. This is the area on which we must rely for the production of cereal and other crops to supply the nation's calories, for both man and beast. The importance of the conservation and proper utilization of this area cannot be over-stressed. But animal products, particularly meat and milk, are also derived to a considerable extent from our veld, comprising about 85 per cent. of our land area, while much of the other protective foods, such as fruit and vegetables, come from our very restricted irrigation areas.

Were all our land areas intact, we might look with greater equanimity on the problem of food production, but unfortunately much of our most valuable veld is scarred, eroded and denuded so that productivity is reduced and restoration will be a long and arduous task. Similarly, some of our best arable land has through injudicious use become depleted of its fertility, weedy and sadly damaged as a result of wind and water erosion.

Even in some of our priceless irrigation lands, brak and water loggings are offering a threat which cannot go unheeded.

It is the task of the Department to solve those difficulties, to restore the veld to its original state of productivity, to ensure that the maximum yield of cereals, particularly of maize, is obtained from our limited areas of good arable land by devising methods that will maintain, or better still, improve, the productivity of the soil, to utilize the irrigation lands so as to obtain the maximum of production and to adopt methods that will prevent deterioration of these lands and finally to make such use of the veld and of the arable land that the *needs* of *all* our people for an abundance of food of good quality will be assured.



Many thousands of these circular reservoirs have been built under the Soil Erosion Scheme.

II. Principal Agricultural Products.

A.—Food Products.

FOOD is one of the essential necessities of life of all sections of the community, and is indispensable to the survival of the nation. This fact emerged all too clearly during the past year, which will be remembered as a year of crisis in the sphere of food in this country. The heaviest demands were made on our agricultural industry at a time when weather conditions were the most trying ever experienced by our farming community. A short discussion of our most important food products will therefore be appropriate.

Maize.

The 1945/46 Maize Season.

The 1945-46 maize season commenced with an estimated yield of approximately 18,000,000 bags. Since, in view of the more scattered nature of the crop, deliveries were expected to be much smaller than would have been the case with a more or less similar yield in the previous season, it was clear from the very start that the country would be hard put to it to meet the needs of the population until the next crop would be available. The utmost degree of economy was therefore essential from the very outset, and in these circumstances it was evident that full control would be necessary more than ever before since, without such control, it would have been impossible to regulate distribution equitably or to secure supplies for the whole season, in spite of the permit system. Full control was therefore again assumed by the Mealie Industry Control Board who, from the beginning of the season, undertook all purchases except those comprising small quantities for local consumption.

Control and Compensation to Agents.—In order to render physical control possible, the Union was again, as in the 1944-45 season, divided into two areas, namely, Area A, consisting of the producing areas of the Transvaal, the Orange Free State and the magisterial districts of Vryburg and Mafeking, and Area B, comprising the remainder of the Union. In the first-mentioned area the Board operated as the sole buyer of maize from producers, through the medium of agents, while dealers registered with the Board, who brought maize on their own account, performed this function in Area B.

As during the 1944-45 season, the compensation to agents was fixed at 5d. per bag, to cover handling and storage costs for a maximum of 1 month, but storage fees were subsequently increased by 2d. to 2½d. per bag in order to cover labour and other costs. On account of the poor harvest, the estimated flow of maize to and from the stores of agents could not be maintained, and those agents who had to rely on the storage compensation of 2½d. per bag per month, if they were not to show a loss on the handling of maize, found that the compensation was inadequate for defraying their costs. Consequently, the matter was considered by the Board and increased compensation awarded to agents.

Prices.—The price of 19s. per bag for the 1945-46 season was fixed after consultation and thorough consideration of all the aspects of the case. Of this amount the Government contributes 2s. 6d. per bag by way of a subsidy, so that the basic price on which consumers' prices rest, amounts to 16s. 6d. per bag instead of 16s. per bag as during the previous two seasons. Handling and storage costs,

however, also show an increase, mainly on account of increases in labour costs and the expected smaller sales, and consequently the selling prices had to be increased proportionately by 1d. per bag above those of the last season. The selling prices of the Board thus range from 17s. 8d. to 19s. 2d. per bag for the best grades, depending on the quantity, which has to be sold at a time. The latter amount also represents the maximum sale price in the trade. One change which has been effected, was again to include grade 4 maize under the best grades as during 1943-44. For loose maize in quantities of less than 200 lb. the price was fixed at 1d. per lb.

No change was made in respect of the variation in the prices of maize products, and the prices of the various classes of products were therefore fixed as follows:—

	Millers' Price Per Bag.	Distributors' Price Per Bag.
	s. d.	s. d.
Fine granulated meal	19 8	21 2
Unsifted granulated meal	19 4	20 10
Other unsifted meal	18 11	20 5
Sifted crushed maize	19 5	20 11
Unsifted crushed maize	18 11	20 5
Samp	24 9	26 3
Mealie rice	24 9	26 3
Maize germ meal	11 9	13 3
Hominy chop	10 3	11 9
Maize bran	6 3	7 9

Equalization levy.—In order to place distributors in Natal and the Cape Province, with the exception of the districts of Vryburg and Mafeking, in the same position as those in the rest of the Union, an equalization levy of 8d. per bag was imposed on all maize acquired by registered dealers in the first-mentioned areas. This amount represents the difference between the basic figure at which selling prices are fixed and the price at which the Board sells wholesale quantities of maize. The same levy was also payable on bran retained by millers where they had milled maize on behalf of their clients. With the prohibition of the sifting of mealie meal, however, this levy, in so far as it affected bran, became inoperative.

Supplementary payment of 6d.—Difficulties in connection with the provision of maize presented themselves even before the season had commenced. The supplies of the old season were practically exhausted and the quantities which were still held available, were concentrated at a few co-operative dépôts. These dépôts therefore had to satisfy all demands, which naturally was an enormous task, and moreover, railway facilities could not always be provided without delay.

Eventually it once again became necessary to take special steps for furnishing adequate supplies for immediate consumption and an appeal was made to producers to expedite early deliveries and, in addition, a premium of 6d. per bag was offered on all deliveries up to 9 June 1945. It was also announced that agents of the Board could at their own discretion, take in maize with a moisture content as high as 15 per cent., subject, of course, to a calculation of weight on a basis of 12½ per cent. moisture. This step had the desired effect and the Board was enabled to procure the necessary supplies in good time.

PRINCIPAL AGRICULTURAL PRODUCTS.

Payments to Agents.—Another problem which arose was that of immediately transporting those supplies which had been delivered by producers to the mills, in order that the latter could be kept going. Delays occurred owing to the fact that the Board did not receive immediate notification of deliveries, and also did not have sufficient supplies available apart from the deliveries for immediate supply. Consequently arrangements were made enabling millers, subject to the previous consent of the Board, to take over maize direct from agents who had supplied them in the past, and the parties made their own arrangements in regard to payment for the quantities delivered.

Storage.—In spite of the short crop, the old problem arose again at first, and already early in the season larger quantities of maize had accumulated at certain posts than could be brought under cover, but this time it caused no concern, for the Board was in a position through direct control to make timely arrangements for bringing the maize stacked in the open into distribution. Provision had, however, again to be made for bucksails to cover the maize stacked in the open for the time being until such time as it could be shifted.

Rationing and economy measures.—In order to make available local supplies of maize last as long as possible, drastic changes in the rationing system were unavoidable. In so far as it was possible it was endeavoured to introduce the curtailments by degrees and to warn consumers in advance, but nevertheless, the latter felt the restrictions keenly, coinciding as they did with the most severe drought conditions. Reductions were made especially in the quantities made available for stock feed and manufacturing purposes.

Steps have been taken to establish local committees in the principal native areas to regulate the distribution of the available supplies among dealers and to supervise the sale thereof. At that time there already existed a general committee for the Transkei as a whole, and a number of regional committees have now been established in the Ciskei and Zululand as well as in the northern Transvaal native areas. The assistance of these committees contributed in a large measure to a more uniform distribution of maize and maize products amongst consumers.

Other measures for curtailing consumption, consist of a reduction of permit-free purchase in the larger urban areas where other food-stuffs which can be substituted for maize are more easily obtainable and a prohibition on the manufacture of sifted mealie meal, samp and mealie rice. The prohibition on the latter two products was also designed to curtail the consumption in the case of persons who are in a position to obtain other foods, since these products are consumed mainly by Europeans, and perhaps, in a lesser degree also by non-Europeans, in urban areas.

Owing to the short crop as a result of the drought in those areas where production consists mainly of white maize and the consequent disparity between the supplies of yellow maize and those of white maize, it was found necessary to impose a prohibition on the manufacture of mealie meal exclusively from white maize. The manufacture of crushed maize, except from yellow maize only was also prohibited. The quantity of yellow mealie meal which had to be incorporated was initially fixed at 20 per cent. but in the course of time had to be raised to 60 per cent., first because the available supplies of maize were petering out and secondly, because the imported maize consisted mainly of the yellow variety.

As regards the manufacture of unsifted mealie meal, it should further be pointed out that the prohibition was partially lifted later in the season and the removal of $7\frac{1}{2}$ per cent. of bran and other waste products was permitted in the case of maize milled for producers.

This step was deemed necessary because of the fact that the smaller mills which mill mainly for producers, were not in a position to process the bran in such a way that the mealie meal could be used for human consumption.

Importation.—In spite of the steps taken for curtailing the consumption of maize as far as possible in an endeavour to make available supplies last out until the end of the season, it was evident that, in addition to the relatively small supplies already imported from neighbouring territories, it would be necessary to import further quantities from overseas. Consequently, later in the season and as shipping space became available, maize was imported from the Argentine in exchange for South African coal. The purchases were made by the Department, but arrangements for the importation and distribution as well as for the purchase and dispatch of the coal were undertaken by the Board. By way of compensation the Board received a commission of 1d. per bag from the State on the landed maize.

The prices for imported maize are considerably higher than those fixed for the locally-produced commodity, but the difference in price was subsidized by the State in order to maintain the prevailing consumer's prices.

Up to and including 13 April 1946, a quantity of 1,354,292 bags reached the Union from the Argentine, while 526,040 bags were imported from the adjoining territories.

The 1946/47 Season.

This season commenced with a crop estimate equivalent to that of the previous season, but with the harvesting of the crops, it was found that the quantities delivered by producers to the Mealie Industry Control Board were less than those of last year with a crop of about the same dimensions. The carry-over of the 1945-46 season was extremely small and in these circumstances, it was found necessary to exercise the utmost economy and to continue rationing on the same basis.

Consequently, as in the previous two seasons, full physical control had to be applied. The Board, through its agents, was again the sole buyer of maize from producers in Area A, while dealers in Area B were registered for this purpose. Agents again received compensation in respect of handling and storage on the same basis as during the previous season.

Prices.—With a view to encouraging maximum production, the Government agreed to fix the producers' price for this season at 22s. 6d. per bag for the best grades and to announce a guaranteed price of 20s. per bag for the subsequent season. For elevator maize the price was fixed at 1s. 4d. per bag and for loose maize at 2s. per bag lower, whereas the price for quantities less than 200 lb. was fixed at 1s. 8d. per lb. Seed-maize prices were fixed at a minimum price of 26s. 6d. per bag. To reduce the price to the consumer the Government contributes 5s. per bag by way of a subsidy, so that the basic price, on which consumers' prices rest amounts to 17s. 6d. per bag. The maximum consumers' price, as compared with the prices of the previous season, increased by 1s. per bag and is at present 20s. 2d. per bag for the best grade, whereas the prices at which the Board sells, range from 18s. 8d. to 20s. 2d. per bag for the best grade, according to the quantity purchased at a time.

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The prices of maize products have, with due regard to the changes effected in the margin allowed to millers, been fixed as follows:—

	Millers' Price Per Bag.	Distributors' Price Per Bag.
	s. d.	s. d.
Unsifted granulated mealiameal.....	20 4	21 10
Unsifted mealiameal other than unsifted granulated mealiameal	19 11	21 5
Sifted crushed maize.....	20 5	21 11
Unsifted crushed maize.....	19 11	21 5
Maize flour.....	25 9	27 3
Bakers' Cones.....	25 9	27 3
Mealie rice.....	25 9	27 3
Germ meal.....	12 6	14 0
Hominy chop.....	11 0	12 6
Maize samp (fine or crude).....	6 9	8 3
Maize feed.....	6 9	8 3

The conditions which obtained during the previous season with regard to prices, e.g. in connection with transport costs and railage, sales in small parcels, increases in price in case of credit sales, etc., were again applicable this season. The equalization levy on purchases by dealers from producers in Natal and the Cape Province, excluding the districts of Vryburg and Mafeking, also remained the same and was again, as in the previous season fixed at 8d. per bag.

Millers' levy.—The levy imposed on all maize which is milled, crushed, or otherwise processed, was increased from ½d. to 4d. per 200 lb. This increase was necessary because the Board had to obtain additional funds for defraying the increased compensation to agents and other costs and the amount required could not be drawn from the margin between the purchasing prices and selling prices allowed to the Board. Another source of income therefore had to be found, and in the circumstances it was decided to increase the levy on milling. This levy is paid by all millers and the exemption previously granted to producers has been discontinued.

The increase in the levy, however, did not induce an increase in the price of maize products, since the margin allowed the millers was such that the increased levy, after a review of the margin, could be recovered from the latter. It was found that various circumstances justified a decrease in the existing margin; for example, in computing the original margin, provision had been made for the storage of maize for the milling requirements of two months, whereas millers actually only kept sufficient stocks for two weeks. Consequently, a decrease in the amount of interest originally allowed, could be effected. In addition, the prices of maize and maize products for the new season (1946-47) were increased by 1s. per bag. Whereas in the case of maize the increase amounted to 1s. per 200 lb., it was 1s. per 100 lb. in the case of mealiameal and crushed maize, and this brought about an increase in the margin allowed to millers which could therefore be reduced by the relative amount. Finally it was found that with the elimination of sifted mealiameal, the loss in weight during the milling process could be reduced by ½d. per bag and that this value could also be taken into account on reviewing the margin.

Storage.—As in the previous season, the storage problem gave rise to concern this season too. The position was, however, aggravated by the serious shortage of grain bags, which induced producers to deliver more maize to the elevators than was originally expected, and also as a result of the large quantities of imported maize delivered

in bulk. Consequently, less elevator space was available for the imported maize than had originally been expected and serious difficulties were experienced in connection with the storage of that supply of maize which was landed in bulk at the Union docks. Moreover, all the locally produced maize could not be brought under cover and consequently had to be stacked in the open, with the attendant risk of damage. Stacking in the open had naturally to be avoided as far as possible, and in these circumstances, consideration was given to the maximum storage at maize mills. The millers were agreeable, but intimated that they would not be in a position to finance the exceptionally heavy purchases thus induced. By way of compromise, it was therefore decided that payment would not be expected from millers directly upon receipt of the maize, but that they would be allowed to pay for stocks as they required them. Since the Board was compelled to pay its agents within 7 days of dispatch, and did not have the necessary funds at its disposal, it negotiated a loan from the Reserve Bank, in order to create the necessary credit facilities for millers. To obtain further storage space it was decided to approach in addition to millers, all co-operative societies and consumers' associations, with the request that they buy stocks for 3 to 6 months in advance, for later distribution amongst consumers, against permits.

As a result of the larger deposits of maize in elevators, it was also found that the loan of £500,000 contracted with the Land Bank earlier in the season would be inadequate for covering all elevator purchases, and in these circumstances a further loan of £5,000 became necessary.

Rationing and Importation.

In view of the serious shortage of all foods, a Directorate of Food Supplies and Distribution was instituted in an endeavour to cope with the position and, in the case of maize, to undertake the rationing of the commodity but as in the past, the Board in consultation with the Director remains responsible for the administration of the rationing of the cereal.

As has been pointed out, as early as the beginning of the season it was clear that the crop would not satisfy the country's requirements and, with a view to supplementing supplies, an endeavour was made to obtain maize from outside the Union. The arrangements made during the previous season in connection with the importation of maize from the Argentine were continued, and until 31 August 1946 a supply of 1,082,287 bags was landed at the Union docks. An amount of 85,233 bags was received from adjoining territories.

Mealie Rice and Samp.

In spite of the additional supplies of maize imported, the stock position remains difficult, and it is clear that unless climatic conditions improve, further reductions of existing grants may be inevitable. In an endeavour to ameliorate the food position generally, the prohibition of the processing of mealie rice and samp has been lifted. The manufacture of these products was originally prohibited with a view to husbanding available supplies and also making more mealie meal available for natives.

Threshing Fees and Milling Costs.

As a result of representations received from threshing-machine owners for an increase in the existing threshing fees, a thorough investigation into the existing threshing costs was instituted by the

Mealie Industry Control Board. The findings were such, however, that an increase of the prices fixed in 1934, namely 6d. per bag of 200 lb. net in the case of unhusked ears and 4d. per bag of 200 lb. in the case of husked ears could not be justified in these circumstances. No change has been effected in this connection.

In the past, representations were received from time to time from producers, in connection with the milling fees of rural millers, and objections were raised in particular, to the practice of millers of not returning the full weight of the products obtained from a bag of maize, but retaining a percentage thereof. This percentage is then regarded as part payment for the services rendered, so that, should it be surrendered to the producer, the milling fee would have to be increased accordingly. This practice however, causes much dissatisfaction, and in these circumstances, an investigation was instituted into the milling costs of rural mills with a view to fixing the final milling fees. It appeared however, that the milling costs were by no means constant and differed from mill to mill. The differences are, however, so big that in the very nature of the case, it would be impracticable and well-nigh impossible to prescribe uniform milling fees; and consequently, it has been decided not to effect any change in the existing position.

Seed.

With a view to increasing maize production, the Mealie Industry Control Board has instituted a seed scheme, designed to make suitable seed available to producers. In pursuance of the scheme, maize which has been tested and found suitable for seed is separated in the packhouses of certain agents for supplying producers later, and maize sold by seedsmen must be accompanied by a certificate to the effect that the maize concerned is suitable for seed.

The production per morgen in South Africa is at present relatively low and, in an endeavour to increase it, efforts are also being made, irrespective of the seed scheme, to breed hybrid maize, which is giving such outstanding results in the U.S.A., in the Union too. Experiments in this connection are already under way at the Potchefstroom College of Agriculture, but these tests are still in the embryonic stage. The development is being awaited with interest.

Kaffircorn.

As is known, the Mealie Industry Control Board also undertook control of kaffircorn during the 1945-46 season.

Initially, permit-free sales of kaffircorn and malt were allowed up to a maximum quantity of 200 lb. per person per month, but later, as a result of the deterioration in the stock position, the quantities were reduced to 50 lb. in the case of kaffircorn and 25 lb. in the case of malt. The position, however, showed a progressive deterioration, and with a view to maintaining certain essential services, allocations were made from October 1945, in addition to the relatively small supplies of kaffircorn set aside for breakfast and infant foods, for the processing of malt for use by the large employers and municipal beer halls only. No malt could be placed at the disposal of other persons and consequently permit-free sales were prohibited entirely. Persons who still had malt in stock, however, were given an opportunity of disposing thereof within a definite period in maximum quantities of 25 lb. per person.

As the new season drew nearer, it became evident that in view of the drought the next kaffircorn crop would also be poor. Greater difficulties than those experienced during the previous season could therefore be expected if control were to be continued and consequently it was decided not to exercise control over kaffircorn during the coming season. The relative regulation was thus revoked on 26 April 1946 and the kaffircorn trade was once again left to the law of supply and demand.

The Mealie Industry Control Board, as the sole buyer of kaffircorn from producers, still had certain supplies on hand with agents, however, at the time of the abolition of control. These supplies were disposed of at ruling market prices which, after the abolition of control, went up by leaps and bounds and the yield, after deduction of the purchasing price and the margin allowed to the Board, will be paid to producers in proportion to their supplies to the Board. The amount available for final distribution is £9,340 and the Board will start making disbursements shortly.

Winter Cereals.

(a) Wheat.

According to the official final estimate the 1945-46 crop would have amounted to 3,400,000 bags, but the actual production was considerably lower than this figure, and the Wheat Industry Control Board received threshing-machine returns, which placed the figure at 2,806,523 bags only. Thus, the crop was even smaller than the particularly poor crop of the previous season, due mainly to the exceptionally small yield of the Orange Free State. The Transvaal crop, too, was disappointing, and the failure of the crop in the north-eastern Cape Province thus reduced the figure for the Cape Province. The following data (threshing-machine returns) for the past four seasons will, however, elucidate the position.

Province.	Bags per 200 lb. net.			
	Season 1942/43	Season 1943/44	Season 1944/45	Season 1945/46
Cape Province..	2,797,027	2,707,463	2,626,780	2,168,563
Transvaal...	774,851	842,956	484,017	419,909
Orange Free State.....	2,585,307	1,784,638	263,352	218,060
Natal.....	989	837	53	--
Total for Union....	6,158,174	5,335,894	3,374,202	2,806,532

The decrease in the crop of the Cape Province must be ascribed to unfavourable climatic conditions, excessive rains in the western, and drought in the north-eastern areas. The poor crop of the Transvaal and the crop failure of the Orange Free State are due to severe drought conditions.

This small crop, which covered less than half the country's requirements, immediately created a most serious position which was much worse than would appear from a comparison of the crop with that of the previous year. The 1944-45 season commenced with a

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considerable reserve in the form of a carry-over of 2,304,436 bags on 30 September 1944. The reserve had been built up with great difficulty during the previous years. It was, however, used up during the 1944-45 season and, as a result, the carry-over on 30 September 1944 amounted to only 733,669 bags—less than a two-months' supply. To make matters worse the demand for bread showed an enormous increase as a result of the strict rationing of maize, especially in those areas carrying a large native population who had replaced mealie-meal by bread. On the Witwatersrand, for example, bread consumption during January, February and March 1946 showed an increase of 47 per cent., 43 per cent., and 31 per cent. as compared with the same months during the previous year. In the Cape Peninsula, where the native population is smaller in proportion, the consumption for these months showed an increase of 9 per cent., 11 per cent., and 14 per cent. only. The demand for meal, and consequently also the consumption of wheat, increased proportionately. As a result of the disappearance of the reserve, the poor crop and the increase in consumption, the Union had to import wheat on a scale unprecedented in its history. According to estimates the Union had to import 3,500,000 bags during the 1945-46 season—2,500,000 bags during the first and 1,000,000 bags during the latter half of the year.

Unfortunately, the shortage of fertilizer and the general dislocation resulting from the war in Europe, the poor crops in North Africa and the poor rice crops in the Far East due to the war there, induced a very serious world shortage of wheat. This shortage is estimated at 80,000,000 bags. As a result, the allocation to the Union through the Combined Food Board (superceded in 1946 by the International Food Board) was drastically curtailed. The allocation for the first half was 170,000 tons or 1,900,000 bags only. The position was further aggravated by the fact that the Union was compelled to accept a considerable quantity of the allocation in the form of flour of 72 per cent. extraction, which means that 72 lb. of flour calculated at the rate of allocation, is equal to 100 lb. of wheat. This means further that, instead of 100 lb. of wheat which yields 96 lb. of meal, the Union obtained 72 lb. of flour only and, in addition, this allocation was further reduced by 24 per cent. in respect of the quantity of flour delivered at the rate of allocation.

Up to 31 August, 1946, 1,435,250 bags of wheat, 545,031 bags of flour and 23,340 bags of meal were imported. The flour was mixed with wheaten meal from which no bran had been removed, and made available for bread. Apart from this, the carry-over, together with the crop, was so small that the wheat requirements of the Union could be satisfied until April 1946 only. As a result of transport difficulties in Canada and the fact that the mouth of the St. Lawrence river was frozen during the winter months, the wheat allocated could not immediately be dispatched. The result was that the wheat stocks in the Union were practically exhausted before the arrival of the imported wheat and flour. Nor did the wheat arrive soon enough to ensure any appreciable improvement in the position and, consequently, the country had to live from hand to mouth. With great difficulty the country succeeded however, in distributing the supply throughout the period in such a manner that no part of the country was at any time without meal or bread, although at times the supplies in some large centres covered less than a week's requirements.

As early as December 1945, it was clear that the wheat position would be very unfavourable. Consequently it was decided, as from 1 January 1946 to prohibit the use of unsifted wheaten meal No. 1 for confectionery and biscuits, and the use of rye flour for cake was

also stopped, with a view to rendering more wheaten meal and rye flour available for bread and rye bread.

After the Union had been informed of its quota and it had appeared that the allocation was inadequate for satisfying the country's needs at the prevailing consumption tempo up to the end of 1946, the monthly wheat quota of millers was reduced by 25 per cent. as from 1 April, 1946, as compared with the average for the three previous months. From the beginning of May 1946, the following *further* measures were instituted for limiting the use of bread, meal and wheat.

- (1) The use of bread after 3 o'clock p.m. until 4 o'clock a.m. and the making of toast were prohibited.
- (2) The use of bread, except for human consumption, was prohibited—consequently no bread could be used for the feeding of animals, the brewing of beer and similar purposes.
- (3) The use of unsifted wheaten meal for any purpose other than the baking of bread was prohibited.
- (4) The sifting of unsifted wheaten meal and the sale of sieves suitable for this purpose, were prohibited.
- (5) Any action which could lead to bread wastage, was prohibited.
- (6) The sale of unsifted meal by millers, except under a permit issued by the Wheat Industry Control Board, was prohibited. Furthermore, by means of a permit it was ensured that millers would not mill more than their monthly quota and that the meal would be distributed amongst their clients on a *pro rata* basis of their purchases during the first three months of 1946. Provision was also made for reserves, out of which areas such as settlements with an increased population, or in which crop failures had occurred, could be supplied.
- (7) From 1 May 1946 the existing quotas of flour and sifted meal to biscuit factories were decreased by 50 per cent., and those to confectioners and macaroni factories, by 62½ per cent.
- (8) The weight of the 2 lb. standard loaf was decreased from 32 oz. to 29 oz. as from 17 May, 1946. The delivered retail price was proportionately decreased from 7d. to 6½d.

The aims of these measures were, first, to render as much meal available for bread as possible; secondly, to release as much bread as possible for the lower-income groups and thirdly, to combat bread wastage. An extensive propaganda campaign for the saving of bread, opened by the Prime Minister in a radio talk was also set on foot. The press, the radio and the bioscope were employed. Thanks to the general co-operation of millers, bakers, the trade and the public, these measures had the desired effect and succeeded in reasonably satisfying the bread requirements of all, in spite of the reduced quantity of wheat. In previous reports mention has already been made of the harmful effect of the shortage of fertilizer on wheat production, the resultant decrease in yield per morgen with the accompanying increase in production costs. In order to ensure increased production, the Department, therefore, on the recommendation of the Wheat Industry

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Control Board, already in April 1945 announced the prices of 38s. and 37s. 6d. for wheat of class A, grade 1 and class B, grade 1 respectively (other classes and grades in proportion). These prices were also fixed later in October 1945, by the Wheat Industry Control Board on this basis. As in the previous year, these prices were calculated on the basis recommended by the Wheat Commission, but modified to make provision for the rise in the prices of the various items making up the production costs and for the estimated decrease in the average yield from 7 to 6 bags per morgen as a result of the shortage of fertilizer.

Further, it was decided to give assistance to producers in certain areas of the north-eastern Cape Province, the Orange Free State and Transvaal, which had had short crops as a result of unfavourable climatic conditions, through the institution of a scheme by which wheat producers could obtain seed wheat and fertilizer on credit, repayable after the first harvest with interest at the rate of 4 per cent. The loan amounting to a maximum of £45 in respect of seed wheat and a maximum of £10 in respect of fertilizer, was obtainable on application. The scheme was applied in 50 magisterial districts, namely 11 districts in the north-eastern Cape Province, 24 districts in the Orange Free State and 15 districts in the Transvaal.

In all 46,776 bags of seed wheat were issued to 4,781 producers.

It was decided to continue with the policy of subsidising the price of bread. The price was maintained at 7d. per 2 lb. loaf, as fixed for the 1944-45 season. As previously stated, the weight of the standard loaf was, however, reduced from 32 oz. to 29 oz. with a view to effecting a uniform distribution as from 17 May 1946 and the price was then reduced from 7d. per 32 oz. to 6½d. per 29 oz. No increase was allowed for 1945-46 in respect of the bakers' margin and the millers' margin was reduced by 2d. since the cost decreases which occurred in the industry were about 2d. per bag more than the increase in costs. The price of meal, as fixed for 1945-46 thus remained unchanged and bakers were able to buy unsifted meal No. 1 for bread at 40s. 6d. per 200 lb. (wholesale). To be in a position to deliver meal at this price, millers had to be able to buy wheat at 30s. 7d. per bag for class B, grade 1 (other classes and grades in proportion). The price payable to producers was 37s. 6d. for B1 wheat, so that the difference between 37s. 6d. and 30s. 7d. had to be made good by way of a subsidy of 6s. 11d. per bag. As in the past, the Wheat Industry Control Board contributed for this purpose, 9d. per bag from its current levy income, while the balance was paid by the Department. The subsidy thus benefited the consumers, since its aim was to keep the price of bread low.

In so far as the 1946-47 crop is concerned, it was announced in April 1946, that prices would be fixed at 40s. 6d. per bag for wheat of class B, grade 1, and 41s. per bag for wheat of class A, grade 1. This represents an increase of 3s. per bag, intended to defray the higher production costs and for encouraging producers to respond to the appeal to grow as much wheat as possible in view of the shortage on the local as well as on the foreign market. The prices of other classes and grades will be fixed in proportion. As in the past the basis fixed by the Wheat Commission has been employed for determining production costs. The items have been changed according to official statistics and the average yield has again been placed at 6 bags per morgen, owing to the shortage of fertilizer.

It is impossible at this stage to determine finally the size of the 1946-47 crop but, according to data, it would appear that it will be

considerably larger than that of the previous season, especially in the Orange Free State.

It is, however, necessary to sound a note of warning against the danger of exaggerated optimism. Even if the most sanguine expectations are realized, it is clear that it will still be necessary to import wheat. Moreover, it should be pointed out that, although the export countries of the northern hemisphere have harvested exceptionally good crops, the northern season commenced with a carry-over which was significantly smaller than that of which they could boast the previous season. In addition, the estimated production in the principal importing countries has by no means reached the normal figure. A further factor to be taken into account, is that the hope which had been generally cherished that the shipping position would improve considerably, has so far not materialized and this factor will in all probability continue to cause concern in 1946-47. The Union will therefore have to continue with the standard loaf in 1946-47 and, although some of the measures introduced in 1946 will probably be relaxed during the new year, the Union will still have to keep a vigilant eye on her wheat supplies.

(b) Other Winter Cereals.*

As stated in previous reports, the control of barley, oats and rye has since November 1942, been entrusted to the Wheat Industry Control Board. In terms of the measure conferring this authority, producers are prohibited from delivering barley, oats and rye to persons other than the Board. The Minister determines the grades and the purchasing and selling prices of these cereals as also the grades for rye flour, rye meal and rye bread. The selling prices of these rye products are fixed by the Board, subject to the Minister's approval. The grades for barley, oats and rye and rye flour, rye meal and rye bread were fixed by Government Notice No. 2377 of 20 November 1942 and revised from time to time. During the 1945-46 season grades and prices were also fixed for crushed oats and ground oats. (Government Notices Nos. 2615 and 2616 of 28 December 1945). The manufacture of rye flour and rye meal is subject to a permit issued by the Wheat Industry Control Board. Oat hay is not controlled, except that the maximum selling prices are fixed by the Price Controller as are also those of cut oat hay.

In so far as barley, oats and rye are concerned, the past season must just as in the case of wheat, be viewed against a background of shortages, rations and imports.

Barley.

The producers' prices for 1945-46 were as follows:—

Class A, first grade (six-row malted barley) 21s. per bag of 150 lb., net.

Class B, first grade (two-row malted barley) 20s. per bag of 150 lb., net.

Class C, first grade (feed barley) 12s. 7d. per bag of 150 lb., net.

Class D, first grade (barley-wheat) 22s. 6d. per bag of 200 lb., net.

The prices of the lower grades of the respective classes were fixed in proportion. It will be observed that, with the exception of feed barley, the prices were the same as those for the previous season.

* To illustrate seasonal tendencies, the statistics are given in some cases up to 31st October, 1946

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It was realized that the price of feed barley should be fixed in relation to the price of other feeds more particularly maize, and its feeding value did not justify a price in excess of 12s. 7d. per bag. The basic selling prices for purposes other than those of feeding and seed were the above prices, plus 7d. per bag for classes A and B (of which 5d. covers the agent's commission and 2d. the Wheat Board's commission) and 9d. per bag for Class D (of which 6d. covers the agent's commission and 3d. the Board's commission). In the case of Class C where the crop was *not* sold as a feed or seed, the basic selling price was 16s. 1d. per bag of 150 lb. net. The difference between the selling and the purchasing price was therefore 3s. 6d. of which 7d. covered the agent's and Board's commission and the remaining 2s. 11d. per bag was intended for partially supplementing the loss which resulted, first because it had been found necessary in 1944-45 to shift barley from the south-western Cape Province to the elevators in order to avoid weevil damage and secondly, because the price of feed barley was reduced by 1s. 7d. per bag as from 1 May, 1945. This reduction was explained in the previous report. Where barley was sold for seed and fodder, the selling prices amounted to the purchasing prices plus 7d. for Classes A and B and plus 9d. for Class D, by way of covering the agent's and Board's commission, and for Class C the purchase price plus 1s. 11d., of which 7d. covered the agent's and Board's commission and 1s. 4d. was intended as a contribution towards covering the losses already mentioned.

The following quantities of barley were purchased during the year under review (A, B and C in bags of 150 lb. net and D in bags of 200 lb. net.) The receipts for 1944-45 are also given:—

	1945-46 <i>in bags</i>	1944-45 <i>in bags</i>
Class A.....	73,205	140,850
Class B.....	15,009	25,938
Class C.....	179,733	281,220
Class D.....	415	905
TOTAL	268,362	448,913

It will be observed that the purchases in 1945-46 amounted to about 180,000 bags less than those for 1944-45. The estimated requirements were as follows:—

Purpose.	Requirements Estimated.	Sales 1944/45.
	In Bags.	In Bags.
Seed.....	30,000	29,071
Feed.....	186,400	185,456
Beer.....	190,000	184,843
Yeast.....	16,300	*20,114
Pearl Barley.....	49,300	34,093
TOTAL.....	472,000	453,577

* Including Malt.

It is thus clear that there was a serious shortage of barley. The crop estimates pointed to a particularly poor crop and for this reason it was decided to allow liberal quantities of barley for seed, pearl barley and yeast, to satisfy the requirements for beer to a limited

extent, and to ration barley as animal feed from the beginning of the season. It soon became evident however, that the crop was even poorer than the indications of the estimates, and from December 1945 up to the end of August 1946, no further supplies of barley were released as animal feed. Subsequent imported barley was again released for this purpose. In view of the general scarcity of cereals in the country, it was decided to import 150,000 bags of barley, of which 115,042 bags were imported up to 31 October, 1946. In those cases, where imported barley was sold for feed purposes, the price was the same as for local feed barley.

Up to 31 October, 1946 the following quantities of locally-grown and imported barley were sold for the purposes indicated:—

<i>Seed</i> (locally-grown barley only)	51,343 bags.
<i>Feed</i> , locally-grown barley	45,178 bags.
imported barley	36,870 bags.
<i>Yeast and malt</i> , locally-grown barley	17,075 bags.
<i>Pearl barley</i> , locally-grown barley	65,381 bags.
<i>Beer</i> , locally-grown barley	90,507 bags.
imported barley	25,528 bags.
<i>Miscellaneous</i>	116 bags.
TOTAL 332,043 bags.	

From the above figures it will be seen that the seed sales exceeded the estimated requirements by 21,000 bags—the estimated requirements being based on the sales of the previous season. The sales in respect of yeast and pearl barley were also considerably higher than those for the previous season. Later in the report further reference will be made to the figures.

Oats.

During the 1945-46 season the oats prices to producers were as follows:—

Class A, first grade: 13s. 1d. per bag of 150 lb. net.

Class B, first grade: 12s. 7d. per bag of 150 lb. net.

The prices of the lower grades were fixed in proportion.

Thus, the prices were lower than those which obtained for the 1944-45 season, namely 16s. and 15s. 6d. per bag respectively. The reason for the lower prices is that it was felt that, as in the case of feed barley, the price of oats should be based on the feeding value of the cereal in comparison with the feeding value and price of maize.

For oats bought from the Board for purposes other than seed or feeds, the basic selling prices were 17s. 5d. and 16s. 11d. per bag for Class A, first grade, and Class B, first grade, respectively. Of the difference, the amount of 7d. per bag was intended for covering the agent's and Board's Commission (5d. and 2d. per bag respectively,) and 3s. 9d. for covering the following losses:—

- (a) losses sustained on 332,000 bags of oats sold from 1 May, 1945 at a lower price for feed;
- (b) storage costs on 280,000 bags of oats as from 1 April, 1945 up to 31 October, 1945;
- (c) storage costs on 280,000 bags of oats subsequent to 31 October, 1945;
- (d) the loss on carry-over at the close of 1944-45 as a result of a fall in price from 15s. 6d. to 12s. 7d.; and
- (e) cost of storage of 90,000 bags in elevators in order to prevent weevil infestation.

As in the case of feed barley, the basic selling prices of oats for seed purposes and feeds, were 1s. 11d. per bag higher than the

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purchasing price. Of this amount, 7d. represented the agent's and Board's commission and 1s. 4d. was intended for covering the above-mentioned losses.

Already at the beginning of the 1945-46 season it was evident that the carry-over plus the new crop would be totally inadequate for satisfying the demand for seed, oats for human consumption and stock feeds. The following are the quantities of locally-grown oats purchased during the period under review as against purchases during the 1944-45 season (bags of 150 lb. net):—

	1945/46.	1944/45.
	Bags.	Bags.
South-western Cape Province.....	459,879	612,157
Remainder of Cape Province.....	624	13,532
Orange Free State.....	2,685	277,238
Transvaal.....	2,971	71,995
TOTAL.....	466,159	974,922

The shortage, as compared with that of the previous season, is clearly reflected in the above figures. The position was further aggravated by the serious shortage of maize, with the result that an unprecedented demand arose for oats as an animal feed, as seed for a cereal crop and as a green feed. In addition, the demand for oats for human consumption was considerably stimulated by the serious shortage of wheat in the country. From December 1945 up to end of the period under review, oats as an animal feed was rationed. In view of the general shortage of animal feed in the country it was decided to authorize the Wheat Industry Control Board to import 1,650,000 bags of oats, of which 1,387,088 bags were received to 31 October, 1946. Owing to a delay in the shipping of the oats which had been purchased overseas, it was found necessary at one stage to use oats which had been set aside for human consumption, for animal feed because of the heavy demand for feed oats which arose. In spite of this step there was a period in which orders for feed had to be held over until the landing of the imported oats. The exceptional demand for oats during the period 1945-46 is reflected in the figures below, which represent oats sales up to 31 October, 1946. The 1944-45 sales are included for purposes of comparison (bags of 150 lb. net).

	Locally-grown.	Imported.	1945/46 Total.	1944/45 Total.
Seed.....	296,723	594	297,317	165,926
Breakfast food.....	89,187	436,457	525,644	328,792
Feed.....	195,566	538,577	734,143	549,804
Miscellaneous.....	15	—	15	15
	581,491	975,628	1,557,119	1,044,537

It will be observed that the seed sales (excluding the 594 bags of imported oats sold outside the Union) exceed the figure for the previous year by 131,391 bags, that the feed figure of 184,339 bags exceeds that for 1944-45, and that the figure representing human consumption is 196,852 bags higher than the corresponding figure for 1944-45.

In so far as the distribution of barley and oats is concerned, the 1945-46 season was the most difficult one since the imposition of control over these cereals at the end of 1942. The distribution was rendered most difficult because of the following factors. The Orange Free State experienced a total crop failure as a result of drought conditions; the purchases in that province decreased from 277,000 bags in 1944-45 to 2,600 bags in 1945-46. In the Cape Province the crop was concentrated in the south-western districts. Furthermore, the rains at the beginning of the 1945-46 season were late in coming and when the drought was broken, all the grain-growing areas received rain at the same time, with the result that an immediate demand arose for seed in all these parts. Added to this, there was the unprecedented increase in the demand for seed and feeds—*representing in all an increase of about 337,000 bags of barley and oats*. Owing to the danger of exotic plant diseases, imported cereals could not be released for seed purposes.

It is evident therefore that, as a result of the abovementioned factors, a far greater demand had to be satisfied than the normal, and within about a quarter of the period. To make matters worse, there was a serious shortage of trucks. The rationing system, naturally, also contributed towards the delay, although the Wheat Industry Control Board did its level best to expedite deliveries. A certain measure of delay is, of course, unavoidable under a system of rationing which is based on sworn statements, but under the prevailing circumstances of general shortage, it was, unfortunately, imperative to introduce such a system. This system presented the only method by which an equitable and rational distribution could be effected.

For the coming season (1946-47) the Board will have at its disposal full particulars obtained from the sworn statements, and these particulars will make a simpler system possible—in so far as supplies permit.

Rye.

The price paid to producers for rye by the Wheat Industry Control Board during the season 1945-46 was 25s. per bag of 200 lb. The price was 1s. 6d. per bag higher than that for 1944-45 since it was felt that rye may be used while the wheat shortage persists in the form of rye bread for supplementing the country's bread supplies. It naturally stands to reason, as was indicated in the previous report, that this consideration will no longer hold when the wheat supplies are again freely available, and that the price of rye will then have to be fixed in accordance with its feed value.

The wholesale prices for rye flour and rye meal were 48s. 3d. and 42s. per 200 lb., respectively, and the minimum and maximum prices of rye bread were 7½d. and 8½d. respectively, i.e. ½d. per loaf higher than in 1944-45. These prices were applicable up to and including 30 April, 1946. In view of the shortage of wheat, the Government had decided to import 287,000 bags of rye, of which 228,000 bags had already been received on 31 October, 1946. At the beginning of the season the Board's selling price for rye for all

PRINCIPAL AGRICULTURAL PRODUCTS.

purposes amounted to 27s. 9d. per bag, i.e. 2s. 9d. per bag higher than the purchasing price. Of this amount of 2s. 9d. the sum of 9d. was intended to cover the Board's and the agent's commission (3d. and 6d. per bag, respectively) and 2s. for building up a rye-reserve fund. Since, however, the price of imported rye was much higher than that of locally-grown rye, and it was decided not to subsidize the price of rye bread, it was necessary to increase the selling prices of rye as well as the prices of rye flour, rye meal and rye bread as from 1 May, 1946. The Board's selling price of imported as well as of locally-grown rye was increased to 58s. 2d. per bag as from that date—the weighted average of the price for the locally-grown crop as well as for the imported quantity. The selling prices of rye flour and rye meal were increased accordingly to 96s. 5d. and 81s. 2d. per 200 lb., respectively (wholesale). The minimum and maximum selling prices of first-grade rye bread were increased to 11½d. and 12½d. per 2 lb.-loaf, respectively. Since the increased flour and meal prices were to represent a gain to millers on supplies of locally-grown rye which they had on hand as at 30 April (as they had bought these supplies at the lower price), it was necessary to collect the differences from millers by way of an equalization levy of 30s. 5d. per bag on rye, 48s. 2d. per bag on rye flour and 39s. 2d. per bag on rye meal which they had on hand at midnight 30 April, 1946.

Up to and including 31 October, 1946, the Wheat Industry Control Board had purchased the following quantities of locally-grown rye (bags of 200 lb. net):—

South-western Cape Province	69,553
Remainder of Cape Province	1,887
Orange Free State	702
Transvaal	981
	73,123

Rye was sold as follows:— (in bags).

Milling purposes	148,445
Seed	29,996
Feed	1,679
Miscellaneous	600
	180,720

Of these quantities, 75,447 bags consisted of locally-grown and 105,273 bags, of imported rye.

The economy measures imposed on wheat and wheaten products with a view to tiding the country over the difficult period, were also partially applied to rye and rye products. As from April 1946 rye products could, for example, no longer be used for confectionery and the economy measures imposed on wheaten bread were applied to rye bread as well.

In so far as rye and oats are concerned, the prospects for 1946-47 show a considerable improvement as compared with those of the past year, but in the case of barley they are far from bright. As in the past the prices of barley, oats and rye for the following season, were announced in advance. In the case of rye the producers' price will be increased from 25s. to 27s. per bag. The prices of barley will then be increased as follows:—

Class A, first grade	25s. 0d. per bag of 150 lb. net.
Class B, first grade	24s. 0d. per bag of 150 lb. net.
Class C, first grade	15s. 6d. per bag of 150 lb. net.
Class D, first grade	30s. 0d. per bag of 200 lb. net.

The prices of oats will be increased to 16s. and 15s. 6d. for Class A, first grade and Class B, first grade respectively.

Meat.*

The drought conditions which obtained over extensive areas, right into January 1946, necessarily had an adverse effect on the supply of slaughter stock to the controlled areas, and during the last few months of 1945 and the first weeks of January 1946 a serious shortage of slaughter stock arose on the controlled market.

The following table reflects the slaughterings in the controlled areas (private slaughter poles excluded) during the year under review:—

Period.	Cattle.	Calves.	Sheep.	Pigs.
1945—				
September.....	47,129	7,052	130,803	31,303
October.....	44,202	8,591	193,259	36,740
November.....	35,206	7,472	247,490	32,638
December.....	25,663	6,173	160,537	32,358
1946—				
January.....	29,880	6,880	106,281	30,009
February.....	43,548	4,707	89,988	24,800
March.....	66,326	5,080	141,757	26,767
April.....	72,813	5,538	148,940	28,023
May.....	74,851	7,424	137,115	27,685
June.....	60,472	7,674	119,619	26,494
July.....	63,973	8,020	175,694	24,326
August.....	64,451	7,900	184,918	23,268

Our stock farmers have undoubtedly suffered severe losses as a result of the drought and, in addition, the shortage of cereals as a pig feed has induced a decrease in our pig population with a resultant pork shortage.

The supplies of sheep and pigs were consistently inadequate, even subsequent to March 1946, when a general improvement took place in the supply of slaughter stock to the controlled areas. The position, however, again deteriorated from the beginning of June 1946 in respect of the Witwatersrand, Pretoria, Durban and Pietermaritzburg areas, but this retrogression was only of a temporary nature and a considerable improvement set in from the second half of July 1946.

As in the previous year, considerable supplies of beef were placed in cold storage this year in all controlled areas and also at Walvis Bay during times when the supply position showed an improvement, for issue during times of scarcity.

The neighbouring territories, and especially the Bechuanaland Protectorate have, during the past season, again dispatched considerable numbers of animals to the controlled markets. During December 1945, the numbers sent from these territories also showed a considerable decrease as a result of the drought, but the season for South-West Africa set in earlier than usual, and in February 1946 large numbers of livestock were beginning to be offered for sale and since then the supply has been maintained at a high level for the remainder of the season.

* For particulars with regard to the meat scheme, see annexure report of the Director of Meat Supplies.

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The following figures reflect the importation of slaughter stock from the relative territories for the past two seasons:—

	January to July 1945.		January to July 1946.	
	Cattle.	Sheep and Goats.	Cattle.	Sheep and Goats.
Bechuanaland.....	9,781	—	16,605	—
Swaziland.....	6,269	—	5,609	—
Basutoland.....	734	—	53	—
South West Africa.....	34,203	16,925	75,642	3,648

Prices.

New prices were fixed for the trade during the year under review, but producers' prices remained unchanged.

Cattle.—In so far as producers' prices are concerned, it should be noted that the seasonal price increase for cattle has been raised from 10s. to 15s. per 100 lb., with a view to rendering it more profitable for farmers to fatten their cattle and to market proportionally more cattle during times of short supplies. Consequently, prices were progressively decreased by 1s., 1s. 6d. per 100 lb. respectively, for each of the three weeks following on the week ended 14 April, 1946, and this level was maintained until 16 June, 1946. From 17 June, 1946, the seasonal increases were recommenced and after this date the basic price was increased weekly as follows:—

17 June to 25 August, 1946, 6d. per 100 lb. per week:—

26 August to 28 October, 1946, 1s. per 100 lb. per week.

Consequently the seasonal peak will be reached on 28 October, 1946, when the price per 100 lb. will be 15s. above the initial price.

The margin between the producers' prices for the various grades has not been disturbed.

Sheep, lambs, goats and calves.—The prices paid to producers during the 1945-46 season in respect of sheep, lambs, goats and calves remain unchanged for the 1946-47 season.

Pigs.—The grading of pigs has been changed and the lowest grade previously described as roughs, has been subdivided into two grades, namely Grade I, Roughs, and Grade II, Roughs, for which the prices have been fixed at 6d. and 3½d. per lb. dressed weight respectively, as compared with the single price of 5½d. per lb. dressed weight for the previous season.

With a view to compensating producers for the increase in the price of feeds, the price of baconers has been increased as from 15 July, 1946, by 1d. per lb. dressed weight for Grade I and ½d. per lb. for Grade II. The prices of other classes of pigs have not been changed.

Dairy Products.

During the past 12 months the dairy industry experienced a difficult time and, since this industry is very sensitive to drought conditions, the drought in the spring and early summer of 1945 exercised an adverse effect on dairy production, and it was not until early in 1946 when general rains fell over large areas, that the corner was turned. It stands to reason that with practically no natural grazing available, the feed position was most critical.

Butter.

The production of creamery butter in the Union, South West Africa, Bechuanaland and Swaziland was approximately 41,000,000 lb., the lowest production level for the past 8 years. The figure was roughly 6,000,000 lb. less than that for 1944-45 and as much as about 14,000,000 lb. less than the figure for 1943-44. The decrease in supply was a heavy blow to the consumer who already had to be satisfied with a considerably decreased supply of vegetable fats.

The accumulated supplies of butter in cold storage at the beginning of the winter amounted to about 7½ million lb., which could be utilized for supplementing the inadequate production and for maintaining a reasonable distribution amongst consumers.

Cheese.

In so far as cheese is concerned, the percentage decrease was about the same as in the case of butter and the production dropped from almost 17,000,000 lb. to about 15,000,000 lb. Cheese production during the previous few years was not subject to the same fluctuations as butter, and the production ranged from 16 to 17 million lb.

The *per capita* consumption of cheese is still relatively low and the market is capable of absorbing considerably larger quantities than those which were available throughout the last few years. In view of the steadily increasing demand for fresh milk and condensing milk, larger supplies of cheese milk are being diverted for this purpose.

Condensed Milk.

The quantity of milk delivered to condensing-milk factories shows a considerable decrease as compared with deliveries during the previous year, and consequently the output of the factories was totally inadequate for meeting the requirements of the population, while at the same time, the oversea position did not allow of any large-scale exportation to the Union.

Prices.

The following tables reflect particulars of the prices which were operative in respect of the various products:—

CREAMERY BUTTER.

Period.	Grade.	Wholesale per lb.	Retail per lb.
		s. d.	s. d.
1/9/1945 to 31/10/1945.....	First.....	1 11	2 1
	Second.....	1 9	1 11
	Third.....	1 7	1 9
1/11/1945 to 31/1/1946.....	First.....	2 0	2 2
	Second.....	1 10	2 0
	Third.....	1 8	1 10
1/2/1946 to 31/8/1946.....	First.....	2 1	2 3
	Second.....	1 11	2 1
	Third.....	1 9	1 11

PRINCIPAL AGRICULTURAL PRODUCTS.

BUTTERFAT.

Period.	Grade.	Price per lb.	Premium per lb.
1/9/1945 to 31/10/1945.....	First.....	s. d. 1 9	d. 7
	Second.....	1 7	7
	Third.....	1 5	7
1/11/1945 to 31/1/1946.....	First.....	1 11	4
	Second.....	1 9	4
	Third.....	1 7	4
1/2/1946 to 31/8/1946.....	First.....	2 1	4d. during June and 6d. during July and Aug.
	Second.....	1 11	
	Third.....	1 9	

CHEESE (CHEDDAR).

Period.	Grade.	Wholesale per lb.	Retail per lb.
1/9/1945 to 31/10/1945.....	First.....	s. d. 1 5½	s. d. 1 8½
	Second.....	1 4½	1 7½
	Third.....	1 2½	1 5½
1/11/1945 to 31/1/1946.....	First.....	1 6	1 9
	Second.....	1 5	1 8
	Third.....	1 3	1 6
1/2/1946 to 31/8/1946.....	First.....	1 7	1 10
	Second.....	1 6	1 9
	Third.....	1 4	1 7

CHEESE MILK.

Period.	Per Gall.	Per lb. Butterfat.	Per Gall.	Per lb. Butterfat.
	d.	s. d.	d.	d.
1/9/1945 to 31/10/1945.....	9½	2 3	2½	6½
1/11/1945 to 31/1/1946.....	10½	2 4½	2	5½
1/2/1946 to 31/5/1946.....	10½	2 5½	—	—
1/6/1946 to 30/6/1946.....	10½	2 5½	2	5½
1/7/1946 to 31/8/1946.....	10½	2 5½	2½	6½

CONDENSING MILK.

Period.	Price per Gall.	Price per lb. Butterfat.
	d.	s. d.
1/9/1945 to 31/1/1946.....	13½	3 0½
1/2/1946 to 31/5/1946.....	11½	2 8½
1/6/1946 to 30/6/1946.....	13½	3 2½
1/7/1946 to 31/8/1946.....	14½	3 3½

FARM-DAIRY BUTTER AND FARM BUTTER.

Period.	Price.
1/9/1945 to 31/8/1946.....	2s. 6d. per lb. maximum.

Margarine.

In last year's report it was stated that margarine would perhaps be on the market during the second half of 1946, but only if all the necessary machinery and plants were available and in production by then and adequate supplies of raw material for the manufacture of margarine were on hand.

The shipping of machinery and plants was, however, unavoidably delayed for a time because of strikes and shipping difficulties and, in addition, the shortage of oil-bearing seeds, that indispensable raw material for the production of margarine, has rendered the commencement of production impossible. At the close of the report year the position is still uncertain.

Deciduous Fruit.

Except for a small quantity to Sweden, there was no export of deciduous fruit during the 1945-46 season, and the Government was again obliged to subsidize the deciduous fruit industry to the extent of £230,000. This amount was £50,000 less than the contribution for 1944-45. As for the previous season, a Land Bank loan to an amount of £750,000 was made available to the Board to finance the scheme, which loan has been repaid in full.

With the exception of grapes, the crops were poor, pears being nearly 50 per cent. below normal.

The total prices (advance plus final payment) were approximately the same as those paid to producers during the previous season and, similarly, the sales policy also remained the same for 1945-46. From certain dates the maximum wholesale and retail selling prices of pears, plums and grapes were again fixed. The prices of peaches were not fixed for this season. Grapes were packed in half-lugs, under two grades, i.e. Choice and Standard, and plums were also packed in half-lugs in order to save packing material.

Adverse climatic conditions on the Johannesburg market for a period of five weeks detrimentally affected the marketing of grapes.

The quantities of fresh fruit disposed of by the Board on the various markets, to the Departments of Social Welfare and Defence, and to factory workers, are shown in the following schedule:—

	1943-44 (tons).	1944-45 (tons).	1945-46 (tons).
Peaches.....	1,325	918	784
Plums.....	1,951	1,250	444
Pears.....	2,126	4,367	1,929
Grapes.....	17,597	18,102	18,178
TOTAL.....	22,999	24,637	21,335

The direct sale of grapes by producers, with the Board's approval, was as follows:—

	1943-44 (tons).	1944-45 (tons).	1945-46 (tons).
Grapes.....	4,309	5,090	4,464

PRINCIPAL AGRICULTURAL PRODUCTS.

The quantities sold to canning factories or processed by the Board itself were as follows:—

	1943-44 (tons).	1944-45 (tons).	1945-46 (tons).
Plums.....	5,262	5,192	4,502
Pears.....	11,846	13,676	8,069
Grapes.....	24,934	19,039	18,991
TOTAL.....	42,042	37,907	31,562

The total quantities of fruit exported were as follows:—

	1943-44 (tons).	1944-45 (tons).	1945-46 (tons).
Peaches.....	—	—	49
Plums.....	—	—	164
Pears.....	—	—	667
Grapes.....	—	—	660
TOTAL.....			1,540

Fifty tons of grapes were exported to the United States of America and the balance to Sweden.

The total quantities handled were, therefore, as follows:—

	1943-44 (tons).	1944-45 (tons).	1945-46 (tons).
Peaches.....	1,325	918	833
Plums.....	7,213	6,442	5,110
Pears.....	13,972	18,043	10,665
Grapes.....	46,840	42,231	42,293
TOTAL.....	69,350	67,634	58,901

Citrus Fruit.

The 1945-46 citrus crop was estimated at 5,000,000 cases of export quality, and of this, 2,767,629 cases were exported, as compared with 981,851 cases exported during the previous season.

The 1946-47 crop is estimated at 3,278,000 cases of export quality, and of this quantity 946,837 cases of oranges, 294,165 cases of grapefruit and 8,992 cases of lemons had been exported up to the 15th August, 1946. The total quantity of citrus exported to the

United Kingdom and other countries up to the end of August 1946, was 1,370,336 cases, of which 1,285,702 cases went to the United Kingdom, 59,523 cases to Sweden, 14,609 cases to Belgium and the balance to other countries, including Mauritius.

It is estimated that by the end of the 1946-47 season a total of approximately 2,458,500 cases will have been exported.

In view of the short crop this season—which is less than 60 per cent. of the normal—the citrus industry offered to retain 25 per cent. of the exportable crop for sale in the Union in order that supplies to local markets in the Union would not be curtailed unduly. The direct loss to citrus growers as a result of retaining their fruit will be approximately £200,000.

During the 1945-46 season 6,650,000 pockets of citrus fruit were sold in the Union by exporters. It is estimated that a total of 6,000,000 pockets of citrus will be disposed of in the Union during the 1946-47 season. Of this, the following quantities had been marketed, through the Citrus Board, up to the 15th August, 1946:—

	First Grade. (export quality).	Second Grade.	Total.
Oranges (pockets).....	884,508	744,615	1,629,123
Grapefruit (pockets).....	179,738	305,723	485,461
Lemons (pockets).....	58,851	58,063	116,914
TOTAL (pockets).....	1,123,097	1,108,401	2,231,498

In addition, it is estimated that a further 500,000 pockets were disposed of direct by growers who do not fall under the Board's control and by "controlled" growers with the permission of the Board.

Maximum producers' prices for fruit sold in the Union during the "in-season" period commencing 13 April, 1946, were fixed as follows:—

	First Grade (export quality).	Second Grade.	Total.
	s. d.	s. d.	s. d.
<i>First Grade—</i>			
Extra Large.....	3 9	3 6	—
Large.....	3 6	3 0	3 3
Medium.....	3 3	2 9	2 9
<i>Second Grade—</i>			
Extra Large.....	3 0	3 0	—
Large.....	2 6	2 6	2 9
Medium.....	2 3	2 3	2 3
Small.....	1 9	1 9	1 9
<i>Third Grade.....</i>	<i>2 0</i>	<i>2 0</i>	<i>2 0</i>

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In respect of oranges exported to the United Kingdom, the following prices are being paid this season, according to the weight and condition of the fruit, irrespective of size:—

Weight of Case.	Condition.						
	1	2	3	4	5	6	7
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
50-61 lb.....	20 9	20 0	19 3	16 6	10 3	5 0	9
61-65 lb.....	21 6	20 9	20 0	17 3	10 9	5 3	1 0
65-69 lb.....	22 6	21 9	20 9	18 0	11 3	5 6	1 0
69-75 lb.....	24 6	23 9	22 9	19 6	12 3	6 3	1 3

NOTE.—1st Condition means not less than 98 per cent. sound fruit.

4th Condition means not less than 75 per cent. sound fruit.

7th Condition means not less than 10 per cent. sound fruit.

On the basis of these prices, and after deduction of all costs incurred from orchard to market, the growers should receive approximately 2s. per pocket net at the tree for export quality oranges sold in the Union, and 4s. per pocket net at the tree for export quality oranges exported.

It will thus be seen that under conditions of short supply citrus growers have subsidized the Union consumers to some considerable extent, particularly when the following comparative prices of oranges in other countries are taken into consideration.

In the Union 1½d. per lb. (approximately).

In the United Kingdom 7½d. per lb. (approximately).

In the United States of America 5d. per lb. (approximately).

In Australia 8d. per lb. (approximately).

From the point of view of the producer, the industry wholeheartedly supports the policy of the Citrus Board to maintain reasonable supplies on the local markets at reasonable prices to consumers.

The prices being paid by the British Ministry of Food for grapefruit and for lemons are also on a sliding scale similar to that for oranges, as set out in the schedule, and vary in the case of grapefruit from 23s. to 16s. 3½d. for first condition fruit according to weight of case down to 1s. 8d. per case for seventh condition fruit, and in the case of lemons from 17s. 3d. to 12s. 9d. per case for first condition fruit according to weight down to 3d. per case for seventh condition fruit.

The greatly reduced 1946-47 citrus crop is the result of drought conditions during the past eighteen months. Extremely dry conditions still prevailed up to the end of August 1946 in the south-eastern parts of the Union, and though the 1947-48 citrus crop is expected to be substantially better than that produced during the present season, it will still be short of normal.

Fortunately the droughty conditions did not assume such proportions as seriously to impair the general condition of the trees, which in most of the important growing areas is still good. Many orchards throughout the country are, however, now beginning to show the symptoms of a lack of nitrogen due to the continued shortage of nitrogenous fertilizers.

During the war years most citrus nurseries greatly curtailed their production of young trees, but are now again producing trees on a fair scale. For the next year or two most of the young citrus trees put out by nurseries will be required by growers to replace old, unprofitable trees or orchards. On many citrus properties replacement

programmes were cut down or suspended during the war years and a good deal has to be done in making up the leeway in this respect.

The incidence of Black Spot disease on citrus fruit in areas previously free of this malady is the cause of much concern. Investigations are proceeding with the object of finding a means to eradicate or control this disease.

The Citrus Board is still operating under and by virtue of powers vested in it by War Measure No. 9 of 1946, but the revision of the South African Citrus Scheme of 1939 under the amended Marketing Act, is now under consideration.

Dried Fruits.

For the 1946 season the production is about 15,500 tons, as against 17,400 tons in 1945. The sultana production was again considerably lower, viz. 2,004 tons, as against 3,400 tons in 1945 and the apricot yield was only about 150 tons as against 680 tons in 1945. The total production of tree fruits was about 3,400 tons as against 4,435 tons in 1945, and in comparison with 1944, the production of dried tree fruit amounts to almost 1,800 tons less this year. This large decrease is mainly due to the heavier demand for fresh fruit for canning and to the apricot crop failure.

As a result of the decrease in production and the expected lifting of the export regulations, packers have tried to take in as much fruit as possible. Consequently 1,000 tons of raisins only could be exported this year. Peaches were in short supply and the same applies to apricots. Packers hope to be in a position to import about 900 tons of prunes.

As in 1945, pools were again instituted in respect of raisins, sultanas, currants and apricots (fresh and dried) and agents of the Dried Fruit Board took in all these dried fruits on behalf of the Board. Exports showed no losses, except in the case of raisins, and producers' prices are therefore generally somewhat higher than those of 1945, which represented a record year. No pool shortages are expected this year.

Since 1944 prices have been fixed for all kinds of dried fruit with the exception of specially dried vine fruits, and the present policy is to continue with these measures. The Board expects to take over full control once more and to stabilize the control by means of regulations under the Marketing Act, instead of by way of War Measures, as has hitherto been the case.

The grading regulations were also reviewed during the year and a new set of regulations was published. Various other changes are desirable, however, and the matter is receiving the attention of interested parties. The aim is to endeavour, by manipulating prices for the various grades, to encourage producers to produce a better article.

The advance prices for dried vine fruits for the past two years were as follows:—

	5 ◇ d. per lb.	4 ◇ d. per lb.	3 ◇ d. per lb.	2 ◇ d. per lb.	1 ◇ d. per lb.	Below Grade. d. per lb.*
1945—						
Raisins.....	—	4½	3¾	2½	1½	—
O.R. Sultanas...	4½	4	3	2½	1½	—
W.P. Sultanas...	—	4	3	2½	1½	—
Currants.....	7	6	5	—	—	—
1946—						
Raisins (A)....	—	5½	3¾	2½	1½	—
Raisins (B)....	—	4½	3¾	2½	1½	½
Sultanas (A)....	4½	4	3½	2½	1½	—
Sultanas (B)....	—	3½	3½	2½	1½	—
Currants.....	6½	5½	4½	—	—	—

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Eggs.

The production of eggs during the past year was higher than in the previous year, while the demand for eggs decreased considerably as a result of the smaller purchases for the army and for ships and the austerity measures imposed on the baking industry.

Due to circumstances relating to the price of poultry feed, it was found necessary to increase prices as early as in September 1945, whereas during the previous year prices were not changed until November; on 28 September, 1945, the following prices were fixed:—

	Wholesale. (per dozen).	Retail. (per dozen).
	s. d.	s. d.
Grade I—		
Extra large.....	1 11	2 2
Large.....	1 9	2 0
Medium.....	1 7	1 10
Small.....	1 5	1 8
Grade II—		
Large.....	1 7	1 10
Medium.....	1 5	1 8
Small.....	1 3	1 6
Grade III—		
Miscellaneous....	1 4	1 4

On 30 November 1945, all the prices, with the exception of those of third-grade eggs, were increased by 3d. per dozen, on 14 December by 3d., on 11 January 1946. by 3d., on 1 February by 4d. and again on 1 and 29 March, so that the wholesale prices exceeded those prevailing on 29 September 1945, by 1s. 11d. per dozen and the retail prices exceeded the then prevailing prices by 2s. per dozen.

This price-fixation was revoked on 12 July 1946, but was again instituted on 19 July and also adjusted on 9 August, so that the prices were 1d. per dozen lower than the prices which became operative on 28 September 1945.

Ever since 1942 a purchasing scheme is instituted annually in order to effect regular distribution and stabilize prices; the schedule below furnishes particulars of the supplies which were held in cold storage each month during the past 3 years.

	Boxes of 30 Dozen Each.		
	1943.	1944.	1945.
September.....	54,727	32,048	47,989
October.....	99,744	42,091	79,293
November.....	125,340	62,200	86,304
December.....	133,197	67,998	90,620
	1944.	1945.	1946.
January.....	134,777	69,735	83,662
February.....	131,785	66,661	73,799
March.....	119,207	55,685	60,989
April.....	100,202	36,473	44,916
May.....	74,172	12,128	26,509
June.....	44,522	1,415	10,325
July.....	28,839	Nil	Nil
August.....	14,078	Nil	Nil

Prior to 12 April 1946, maximum prices for eggs were fixed for controlled areas only, but since this date a maximum price was fixed for the sale of eggs throughout the Union (except in the controlled areas) viz. 3s. 8d. per dozen.

The following maximum wholesale and retail prices were fixed in respect of cold-storage eggs as from 22 February, 1946.

	Wholesale.	Retail.
	s. d.	s. d.
Grade I—		
Extra Large.....	2 5	2 8
Large.....	2 3	2 6
Medium.....	2 1	2 4
Small.....	1 11	2 2
Grade II—		
Large.....	2 1	2 4
Medium.....	1 11	2 2
Small.....	1 9	2 0
Grade III—		
Miscellaneous.....	1 9	1 10

These prices are 1d. per dozen higher throughout than those fixed on 2 February, 1945.

Groundnuts.

It is common knowledge that a world shortage of oil-bearing seeds exists and is likely to continue for another few years. This shortage has naturally given rise to a very difficult position in the Union. The scarcity of vegetable fats for domestic use and for the manufacture of soap and the inadequate supplies of protein-rich foodstuffs for our stock have created a serious problem.

Since groundnuts are rich in oil, large quantities of fats and oil-cakes are prepared from them and, consequently, the Department has again, as in 1944 and previous years, found it necessary to encourage our farmers to increase their production of this crop.

A groundnut loan scheme was announced at the end of 1945 and credit facilities created thereunder for farmers for the purchase of a maximum quantity of 8 bags of groundnut seed, the cost of which is repayable within 12 months from the date of the loan, with interest at 4 per cent. per annum. The scheme was made operative in the following areas:—

Transvaal.—Waterberg, Potgietersrust, Pietersburg, Soutpansberg, Letaba, Groblersdal, Middelburg, Lydenburg, Pelgrimsrust, Barberton, Nelspruit, Bronkhorstspuit and Pretoria.

Natal.—Dundee, Helpmekaar, Newcastle, Utrecht, Vryheid, Paulpietersburg, Estcourt and Weenen.

Other areas.—The Vaalhartz irrigation area.

Apart from the loan scheme, groundnuts were produced even in the northern Orange Free State, in the neighbourhood of Parys and Vredefort where this crop had not been grown in the past.

The groundnut crop of 1946 which will reach trade channels, is estimated at 250,000 bags of 100 lb. (shelled) as compared with 120,000 bags for 1945. Hence, the crop has been almost doubled.

In view of the short supplies, the Director of Food Supplies and Distribution has frozen the supplies for utilization for special purposes. The price of groundnuts is at best, the maximum price as

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fixed by the Price Controller, viz. 35s. 9d. per 100 lb. unshelled, and 55s. per 100 lb. shelled, while the price for under-grade ground-nuts is fixed in accordance with the agreement between purchaser and seller.

Potatoes.

Already for a number of years maximum prices for potatoes have been fixed regularly, but compulsory grading has only been applied on the nine large markets, since July 1945, when three grades were introduced, viz. first, second and third grades. Since then, however, the grading regulations were revised to provide for under-grade as well.

Government graders hold regular inspections at all the large municipal markets, and also at the shops or places where potatoes are stored or sold, to ascertain whether the regulations are carried out.

The maximum prices fixed on 23 July 1945, according to grades and classes, make provision for a producers' price of 30s. per bag for Grade I, 26s. 6d. per bag for Grade II, and 22s. per bag for Grade III, while the prices to markets and agents were fixed at between 2s. 3d. and 2s. 6d. higher and to consumers at 9d., 8d. and 7d. per 3 lb. of the respective grades. These prices were increased on 17 August and 21 September 1945, but were slightly reduced on 15 March 1946, until the following prices were fixed on 16 August 1946. In direct sales between producer and dealer the maximum prices are 34s. 6d., 33s. 6d., 27s. 6d., 22s. and 15s. per bag of 150 lb. f.o.r. first grade classified, first grade unclassified, second grade, third grade and below grade, respectively, while the prices of 35s. 3d., 34s. 3d., 28s. 3d., 22s. 9d. and 15s. per bag are applicable to the respective grades when the producer sells by auction or otherwise, through an auctioneer, market agent, broker or other agent and 37s. 9d., 36s. 9d., 30s., 24s. 3d. and 15s. per bag for the respective grades when the producer sells through a market master.

Consumers' prices were fixed at 10d. per 3 lb., 10d. per 3 lb., 11d. per 3 lb. and 7d. per 3lb., with the exception of under-grade potatoes, for quantities of less than 150 lb. Outside the controlled areas the maximum consumer's price was fixed at 11d. per 4 lb.

Generally speaking, the price level was the same as for the previous year.

The potato crop for the 1945/46 season is estimated at 2,885,000 bags as compared with 2,500,000 bags for the 1944/45 season, and the position shows a considerable improvement. It was not found necessary to exercise control, as during the previous two seasons. The quantity of first-grade potatoes in relation to the other grades was, however, not quite adequate.

In the course of the season the producers carried out the grading requirements satisfactorily and the difficulties gradually disappeared. In addition, the adaptation of the grades has also been facilitated.

As stated above, the yields of the various potato areas were very satisfactory, except that the lowveld crop unfortunately suffered a set-back as a result of frost and was not marketed until late.

A quantity of potatoes of inferior quality for which there was no demand in the Union, but which, nevertheless, was suitable for planting, was allowed for export to Portuguese East Africa, on the understanding that an equal quantity of table potatoes would be supplied to the Union later.

The quantities of potatoes disposed of during the previous three calendar years on the eight big markets of the Union are: 1934: 336,274,900 lb.; 1944: 175,263,400 lb.; and 1945: 220,699,200 lb.;

During the past year the Department again, as in previous years, imported seed potatoes on behalf of the State in order to maintain potato production. The quantity imported over the period of twelve months totalled 25,000 boxes. This step was taken simply because, under the prevailing circumstances the Department was in a better position than private enterprise to obtain supplies and shipping space.

Since local conditions are so favourable for virus infestation with its resultant degeneration of seed potatoes, the Union has up to the present been compelled to import seed potatoes for the maintenance of potato production, but very valuable selection experiments are at present being undertaken on the Riet River Settlement on potatoes with a view to breeding seed potatoes suitable for distribution amongst farmers for production purposes.

Vegetables.

The supply position in respect of vegetables was satisfactory, and in any case, better than during the previous year. The lowveld crop had been most promising before it was damaged by frost. The winter supplies were larger than during the previous year, but of a somewhat poorer quality. Tomatoes and cabbages were freely obtainable throughout the winter months.

As a result of favourable climatic conditions during autumn in respect of both vleis and ridge soils and also because of larger plantings, the Cape Town market was for a time glutted with a few kinds of vegetables. In a special endeavour to ease the position in Cape Town, the Food Control Organization tried to facilitate distribution by opening a central dépôt and bringing more mobile markets into operation. The chief aim was to utilize the low price level prevailing in favour of the consumer and so increase consumption, for the benefit of the consumer as well as the producer who had the surplus on hand.

The following table shows the sale of 7 of the most important vegetables on the 8 large markets for the calendar years 1943-1945:—

	1943. (in 100 lb. quantities).	1944. (in 100 lb. quantities).	1945. (in 100 lb. quantities).
Onions.....	464,917	509,553	546,953
Sweet Potatoes.....	238,431	301,688	333,524
Tomatoes.....	495,621	761,969	856,189
Green beans.....	179,313	195,523	187,397
Green peas.....	183,881	187,451	174,996
Cabbage.....	470,015	494,995	494,653
Cauliflower.....	90,776	90,493	76,241
TOTAL.....	2,122,954	2,541,672	2,669,953

The glut which for a time obtained on the Cape Town market in respect of a few kinds of vegetables, mainly carrots, is due to the fact that farmers relied on the canning and dehydration factories for orders which would absorb their produce, whereas the factories, owing to a shortage of tin sheets and the absence of a market for their products, were not in a position to process vegetables and so alleviate the position. With the cessation of hostilities the Admiralty did not enter into any further contracts for dehydrated vegetables and since the British Ministry of Food did not show any interest

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worth mentioning in the product and no alternative export market was available, the dehydration factories practically had to stop production. Actually they have considerable supplies on hand.

Viticultural Products.

The production of spirits fluctuated considerably during the past three years, while that of brandy remained about the same and the available supply of wines did not increase to any marked extent. The consumption of spirits and brandy, for purposes other than fortification, however, showed a considerable increase in 1945, as compared with the previous year.

The following table gives comparative figures:—

Year.	Production of spirits including Classes B and C in Proof Gallons.	Production of Brandy in Proof Gallons.	Available good and quantity wines for local consumption in Leaguers.
1943.....	4,974,819	1,294,269	93,728
1944.....	5,879,217	1,271,239	97,537
1945.....	5,055,619	1,300,308	101,872

Year.	Total Local Consumption of Spirits and Brandy in the form of Brandy, Gin and Liqueurs in Proof Gallons.	Consumption of Mixed Brandy in Proof Gallons.	Consumption of Spirits for Fortification including Class B in Proof Gallons.
1943.....	2,646,779	2,153,755	2,038,323
1944.....	2,588,707	2,098,287	2,121,321
1945.....	3,300,298	2,643,977	2,076,313

Except in the case of gin, liqueurs and Vermouth, the liquors exported during the year under review, show a considerable increase as reflected in the following table:—

	1944/45.		1945/46.	
	Gallons. in Barrels.	Gallons. in Bottles.	Gallons. in Barrels.	Gallons. in Bottles.
Samples investigated.....	1,917	4,982	1,938	4,947
Dry White Wines.....	73,236	74,407	114,558	121,967
Dry Wines.....	709,688	65,188	891,966	100,073
Sherry.....	338,586	138,815	561,808	66,977
Sweet Wine.....	692,000	62,272	1,127,420	59,166
Brandies.....	—	420,217	—	468,574
Gin.....	—	164,922	—	60,014
Liqueurs.....	—	34,040	—	29,366
Vermouth.....	132,666	42,515	110,536	45,452

The minimum price of good wine for the 1946 season was fixed at £8 per leaguer f.o.r., wine farmer's station, and the price of quality wine at £12 per leaguer. The corresponding prices for the 1945 season were £7. 10s. and £11. 10s. per leaguer, respectively.

Chicory.

During the 1945/46 crop year the following quantities of chicory were received and distributed by the Chicory Control Board:—

Grade 1	4,744,078 lb.
Grade 2	408,188 lb.
Grade 3	80,372 lb.

TOTAL: Grade Chicory	5,232,638 lb.
Under-grade	34,540 lb.

GRAND TOTAL 5,267,178 lb.

The crop was somewhat smaller than that of the previous year—a fact which is ascribable to inferior seed, severe droughts and strong winds, which caused extensive damage. The seed produced by the Department yielded excellent results, but the imported seed was disappointing.

During the year the Board disposed of 12,000 lb. of seed and consequently a larger crop is expected next year. The demand for chicory has increased considerably as a result of the decrease in tea supplies and the shortage is being supplemented by imports. The aim is to grow adequate supplies locally and the next crop will already be appreciably larger. Arrangements have been made for the importation of a further 19,000 lb. of seed from overseas for the following plantings.

The prices fixed for 1945, viz., 35s., 30s. and 25s. for the three grades remained unchanged and were maintained during 1946.

B.—Other Agricultural Products.

In addition to the food products discussed in the previous chapter, this country also produces a large diversity of other agricultural products of great economic value.

Wool.

If regard is had to the fact that there are some 40,000 European wool-growers in this country, who together own about 26½ million woolled sheep, and that wool constitutes our most important agricultural export product, the necessity for stabilizing the wool industry and the income of such a large percentage of our population will be readily appreciated.

The Wool Disposal Agreement entered into during the past year and confirmed by the Wool Act of 1946 (Act No. 19 of 1946) is the means by which the marketing of wool has been placed on a firm and longterm basis and stability ensured. This Act gives statutory approval to the agreement between the Governments of the United Kingdom, the Commonwealth of Australia, the Dominion of New Zealand and the Union of South Africa as regards the disposal of supplies of wool which have accumulated during the years of war, together with future wool clips, and provides for the institution of a South African Wool Disposal Organization as well as for the imposition of a levy on wool for defraying the costs of the scheme. The Act also institutes a statutory Wool Board, to take the place of the earlier Advisory Wool Council.

Under the Wool Disposal Agreement the 1945/46 clip was still purchased at fixed prices. Until such time as the South African Organization could be founded, the British Wool Commission continued to effect purchases. The quantity of wool bought by the British Wool Commission during the 1945/46 wool year shows a

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decrease of about 26,000 bales on the quantity for 1944/45 which is probably also due to the severe drought which prevailed in large areas of the Cape Province and had an adverse effect on the clip. The wool was also of a poorer quality. The average price for the clip remained the same as during the previous season as did also the selling prices. The demand for wool at the fixed selling prices was exceptionally keen during the season. The major portion of the Union's accumulated supplies have been disposed of and at the opening of the season only about a quarter of the quantity available at the beginning of last season will be on hand.

In pursuance of the recommendation of the London Wool Conference, wool auctions will again be reviewed during the next wool season, with the backing of a reserve price which is a feature of the Wool Disposal Agreement. Wool-growers the world over, and especially in the Dominions, are anxiously awaiting the first auctions to see how world buyers will judge the price level of wool fibre.

Mohair.

The supplies of mohair disposed of at Union ports amounted to 5,479 bales on 30 June 1946, whereas the unsold supplies on the same date amounted to 2,983 bales.

Reliable figures on the export of mohair are available only in respect of the 8 months ending 28 February, 1946, when the figure amounted to 24,804 bales.

The price of mohair shows an improvement of 2d. to 7d. per lb. on that of the previous season whereas kid's mohair fetched the unprecedented price of 64d. per lb.

Hides and Skins.

In a leather-starved world it is natural that the market for hides and skins should have remained very firm while all export prices were subject to international control.

Prices to Union tanners for wetsalted, drysalted and sundried hides fixed by local control, were fully maintained until the end of June 1946, when the prices were increased by $\frac{3}{4}$ d., $1\frac{1}{4}$ d., $1\frac{1}{2}$ d., per lb. respectively, the increase to the producer for green hides from animals slaughtered at an abattoir being $\frac{3}{4}$ d. per lb.

At the same time the prices to local tanners for goat skins were increased by twenty five per cent. and for coarse and coloured sheepskins (excluding Crossbreds) by approximately 40 per cent.

The following are the maximum prices fixed:—

I. Maximum prices of hides per lb.

Description of Hides.	Firsts.	Seconds.	Thirds.	Fourths.
	d.	d.	d.	d.
(a) Drysalted—				
(1) Under 6 lb.....	14 $\frac{1}{2}$	13 $\frac{1}{2}$	9 $\frac{1}{2}$	7 $\frac{1}{2}$
(2) 6 to 9 lb.....	13	12	8	7
(3) 10 to 19 lb.....	10 $\frac{1}{2}$	9 $\frac{1}{2}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$
(4) 20 to 29 lb.....	9 $\frac{1}{2}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$	6 $\frac{1}{2}$
(5) 30 lb. or over.....	8 $\frac{1}{2}$	7 $\frac{1}{2}$	6 $\frac{1}{2}$	5 $\frac{1}{2}$
(b) Sundried—				
(1) Under 15 lb.....	12	11	9 $\frac{1}{2}$	6 $\frac{1}{2}$
(2) 15 to 24 lb.....	11	10	8 $\frac{1}{2}$	6
(3) 25 lb. or over.....	10	9	7 $\frac{1}{2}$	5
(c) Green abattoir hides.....	4 $\frac{1}{2}$	—	—	—
Wetsalted abattoir hides....	6	—	—	—

II. Coarse and coloured skins: Prime	12d. per lb.
Seconds	9d. per lb.
First rejects ...	6d. per lb.
Second rejects ..	3d. per lb.

On the 27th June 1946, the International Hide, Skin and Leather Committee was abolished with the result that there was an immediate increase in all prices. Individual countries, however, in an effort to prevent inflation as far as possible, applied local control and fixed prices at which local hides and skins may be sold or bought, which has had the effect of keeping import prices to these countries within reasonable bounds.

As the total production of the types of hides and skins used in local tanneries cannot be absorbed by these tanneries, the exportable surplus is sold at enhanced prices.

Merino sheepskin prices fluctuated somewhat during the period under review. At the end of August 1945, the prices for Comings, Longs, Mediums and Shorts were respectively 11½d., 9½d., 8½d., 7½d. per lb. as compared with 13½d., 12d., 10½d., 9½d. per lb. at the end of August 1946.

Sound Angora skin prices were 10d. and 14d. per lb. respectively for the same periods.

Gloving skin prices at the end of August 1945, for sound Large, Medium and Light were 5s. 6d., 4s. 6d., 3s. 9d., each as against 12s. 3d., 11s. 3d., 9s. at the end of August 1946.

The total weight of hides and skins exported during the year under review was approximately 43,000,000 as against 34,000,000 during the calendar year 1945. The increase is primarily due to the export of Merino skins to continental countries (chiefly France and Belgium) owing to the cessation of hostilities.

A measure of improvement in the curing of hides and skins produced in abattoirs is evident, primarily due to the inspections carried out on behalf of the Controller of Leather. Farmers in general, however, still do not appreciate the need for the better faying and curing of their hides and skins.

Hides and Skins—Exports 1945-46.

	1/9/45-31/8/46 lb.	1/1/45-31/12/46 lb.
Merinos.....	11,849,143	6,089,231
Shearlings.....	13,731,121	10,739,074
Coarse and Coloured.....	536,012	854,870
X Bred.....	657,268	615,299
Glovers.....	7,739,757	6,526,664
Goat skins.....	2,655,164	3,265,912
Angora skins.....	297,529	351,398
Drysalted Hides.....	1,380,197	1,455,633
Drysalted Kips.....	252,215	168,670
Drysalted Calf.....	337,237	263,953
Sundried Hides.....	2,856,559	3,153,217
Sundried Kips.....	281,273	305,430
Sundried Calf.....	70,985	155,243
Karakul skins.....	125,874	227,003
Ostrich.....	38,165	22,103
	42,808,499	34,193,700

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Tobacco.

The tobacco crop for the past year amounted to 32,594,000 lb. Of these 18,034,000 lb. were air-cured, 13,774,000 flue-cured and 786,000 lb. Turkish tobacco.

Although the yield was considerably higher than the crop of 24,398,000 lb. of the previous year, the receipts in relation to the plantings were somewhat disappointing as a result of droughts and untimely rains in some areas.

The quantity of leaf tobacco processed during 1945 for disposal shows an unexpectedly large increase, viz. 33,061,000 lb. as against 30,086,000 lb. in 1944. This expansion of the market led to a sharp decline in the tobacco supplies of the country, in consequence of which the Tobacco Control Board once again introduced a duty-free import quota of 1½ million lb. and 400,000 lb. from Southern Rhodesia. Then too, there is the 400,000 lb. duty-free importation from Northern Rhodesia.

Owing to the ever-increasing costs of production, a further increase of 10 per cent. in producers' prices was allowed. The price of Virginia tobacco is at present the basic price plus 55 per cent. For Turkish tobacco, on the other hand, no price has been fixed and it rests with the co-operative society concerned to arrange prices with the manufacturers.

The average selling price of agents of the Board has increased since 1939/40 as follows:—

	1939/40. (Pennies per lb. leaf tobacco).	1945/46. (Pennies per lb. leaf tobacco).
Flue-cured.....	17·68	27·90
Light air-cured.....	11·64	23·67
Dark air-cured.....	7·27	13·17

Due to the poorer quality which reduced the percentage of higher grades, the average price of flue-cured tobacco shows a decrease of 0·63d. per lb. in comparison with that of 1944/45, in spite of an increase in price.

Cotton.

Due to the low prices which obtained for cotton since 1931, the production decreased tremendously and the following figures reflect this retrogression in the cotton industry from 1925/26 when the yield reached the record peak of 16,305 bales:—

<i>Production.</i>	<i>Bales of Fibre of 500 lb. Each.</i>
1922-23.....	5,218
1925-26.....	16,305
1929-30.....	12,970
1931-32.....	2,240
1938-39.....	598

With a view to the scarcity of cotton and the prospects for better prices as a result of the war, the Department in 1939 again encouraged the cultivation of cotton and the yields immediately increased to 1,649 bales in 1939/40. The expectation of higher prices did not materialize, however, and, in 1942/43, the yield decreased to 467 bales of fibre cotton and in 1944/45 to the low level of 270 bales only.

For the year 1945/46 the crop is no better but the price has suddenly revived and risen to 14d. per lb. fibre, whereas two years ago it was 8d. and after the depression of 1930 even as low as 4½d. per lb.

The erection of a cotton weaving mill, which is under way has increased the demand for cotton and there is a possibility that, if weather conditions are favourable and good rains fall before the middle of April, a fairly large area will be planted, especially in the Barberton and other lowveld areas.

III. Administrative Activities.

During the past year two important changes in the internal structure of the Department were effected.

The first of these was the regrouping of the functions of two of the divisions which maintain a very close contact with the farming community, viz. the old Division of Animal and Crop Production and the old Division of Soil and Veld Conservation now known as the Division of Agricultural Education and Research and the Division of Soil Conservation and Extension, both under the administration of a Director. This change took effect from 1 September, 1945, and agricultural education at the Colleges of Agriculture and all research work at research stations now fall under the former Division, while the latter is entrusted with the task of soil conservation and extension.

The second development was the formation, with effect as from 1 October, 1945 of the former Division of Forestry into an independent Department under the Minister of Agriculture and Forestry, with a Director as its chief.

Funds.

The expenditure of the Department for the financial year 1945/46 amounted to approximately £8,625,758 under the various votes, whereas the revenue amounted to £601,780 as compared with £6,990,356 and £370,497 respectively, for the year 1944/45.

The increase is reflected in all the votes of the Department, but the extension of the activities in respect of soil and veld conservation which accounted for an increase in expenditure of from £163,300 to £251,970 and the increase in expenditure of the Division of Veterinary Services from £542,511 to £648,124 for the respective financial years, merits special mention. The expenditure of £8,625,758 includes £6,209,424 for various subsidies, mainly consumers' subsidies amongst which may be mentioned the subsidies in connection with the importation of maize and the stabilization of its price and also the importation of wheat and the stabilization of the price of bread. A special subsidy of £200,000 was paid to citrus farmers during the year 1945/46 by way of compensation for the pool losses sustained by them in respect of the 1944 crop owing to the fact that no export market existed.

The increased revenue figure for 1945/46, as compared with that of 1944/45, is mainly due to the amount of £147,657, repaid by the Land and the Agricultural Bank of South Africa in respect of a loan granted to the Deciduous Fruit Control Board for the precessing of fruit—a loan originally granted by the Department but subsequently paid out by the Bank mentioned.

ADMINISTRATIVE ACTIVITIES.

Staff.

The Departmental organization, the machinery designed for maintaining and continuing the activities of the Department, necessarily underwent considerable changes as a result of resignations, transfers, promotions, superannuations and the return of officers from military service. The most important changes include, inter alia: The promotion of Dr. M. M. S. du Toit, Director of the Western Province Fruit Research Station, Stellenbosch, to the post of under-Secretary in succession to Colonel C. J. van Heerden who is now a Public Service Commissioner; the resumption of service of Mr. N. J. Eddy as Principal Accountant, after serving in the Department of Defence; the promotion to the post of Chief Clerk, Grade 1, of Mr. H. J. Neethling; the promotion to the post of Director of the Division of Agricultural Education and Research of Dr. H. W. Turpin and the promotion to the post of Assistant Director of Dr. A. R. Saunders; the promotion of Messrs S. J. de Swardt and C. H. Spamer to the posts of Chief and Assistant Chief of the Division of Economics and Markets, respectively; the promotions of Dr. J. C. Fick and Mr. T. F. Cronje to the posts of Assistant Directors of the Division of Soil Conservation and Extension.

The following senior officers of the Department passed away during the year: Mr. M. M. Naser, Senior Veterinary Officer, and Mr. A. S. Rayner, Assistant Registrar of Co-operative Societies.

The Department wishes to express its sincere appreciation to the many officers who, so unstintingly gave their time and energy during

Return of approved staff of the Department for the year 1 September 1945 to 31 August 1946.

	Admini- strative.	Clerical.	Professional. Higher.	Professional, Lower.	General.	Non- prescribed.
Secretariat.....	41	136	26	10	11	50
Veterinary Services.....	6	72	161	91	51	1,154
Agricultural Education and Research.....	2	21	104	39	43	57
Horticulture.....	—	12	28	49	6	15
Entomology.....	—	4	36	24	11	22
Soil Conservation and Extension	4	41	157	95	1	50
Botany and Plant Pathology...	—	5	26	40	9	9
Chemical Services.....	1	9	72	32	6	53
Dairying.....	1	21	21	—	10	47
Economics and Markets.....	1	35	23	82	10	187
Guanos Islands.....	2	7	—	—	30	28
Stellenbosch-Elsenburg College of Agriculture.....	1	11	48	8	25	11
Western Province Fruit Research Station, Stellenbosch.....	—	5	28	—	12	7
Agricultural Research Institute, Pretoria.....	1	5	32	4	10	10
Grootfontein College of Agriculture.....	1	7	16	7	10	2
Cedara College of Agriculture...	1	4	14	2	10	2
Potchefstroom College of Agriculture.....	1	5	14	5	9	1
Glen College of Agriculture.....	1	5	16	6	13	5
Dehydration and Cold Storage..	—	—	2	—	—	39
TOTAL.....	64	405	824	494	277	1,749

the difficult year which has just passed. The loyal services rendered by them merit the appreciation not only of the Department, but also of the farming community and the numerous other sections of the population affected by the Agricultural Industry.

Principal Officers of the Department.

- Dr C. H. Neveling, Secretary.
Mr. J. J. Adams, Under-Secretary.
Dr. M. M. S. du Toit, Under-Secretary.
Dr. F. J. van Biljon, Under-Secretary and Chairman of the National Marketing Council.
Dr. P. J. du Toit, Director of Veterinary Services.
Dr. G. v. d. W. de Kock, Deputy Director of Veterinary Services.
Dr. H. W. Turpin, Director, Agricultural Education and Research.
Dr. J. C. Ross, Director, Soil Conservation and Extension.
Dr. F. G. Anderssen, Chief, Division of Horticulture.
Dr. T. J. Naude, Chief, Division of Entomology.
Dr. R. A. Dyer, Chief, Division of Botany and Plant Pathology.
Dr. J. P. van Zyl, Chief, Division of Chemical Services.
Mr. S. J. de Swardt, Chief, Division of Economics and Markets.
Mr. L. J. Veenstra, Superintendent of Dairying.
Dr. J. S. Marais, Principal, Stellenbosch-Elsenburg College of Agriculture.
Prof. H. B. Davel, Director, Agricultural Research Institute.
Vacant, Director, Western Province Fruit Research Station.
Mr. T. L. Kruger, Superintendent, Division, Guano Islands.
Dr. G. M. Dreosti, Officer-in-charge, Dehydration and Cold Storage.
Mr. Rees Davies, Superintendent, Low Temperature Research Laboratory.
Mr. N. J. Eddy, Principal Accountant.
Mr. D. J. Seymore, Editor.

The Agricultural Library.

The Central Agricultural Library does not only supply literature to civil servants, but also offers two schemes under which farmers can avail themselves of the Department's Library.

Under the one scheme every farmer is enabled to become a member by the payment of a deposit of 10s. which is repaid when the farmer ceases to be a member. Under this scheme about 260 farmers became members during the past year, so that the total membership is now 1,400. This rapid increase in membership is mainly due to the fact that the library has abolished the annual subscription of 3s. which was formerly a condition of membership, as from 1 April, 1945.

The second scheme is intended for farmers' organizations, farm schemes, etc. In this case a deposit of £1 is charged but members are allowed a loan of 10 books, which may be retained for a period of 3 months. Under both schemes literature is sent to and fro post-free. During the past year seven members subscribed under this scheme so that 96 farmers' organizations and farm schools are at present members of the library.

During the past year, 810 complete works have been added to the collection of the library in addition to thousands of bulletins, journals etc. A total of 768 complete works was acquired by the central Agricultural Library for divisions of the Department, classified under the Dewey decimal system and issued to the various divisions. This number does not include standing orders for periodicals, etc.

ADMINISTRATIVE ACTIVITIES.

During the past financial year, 26,501 publications were lent out to officers and farmer members—a total of 6,307 more than the previous year.

The increase in the membership of the Library and the figures of books loaned furnish proof of the growing appreciation among farmers and other members of the community of the value of agricultural literature, but the Department would be pleased to see an even more extensive utilization of the sources offered by the Agricultural Library.

Registration of Cold Stores.

In terms of a provision contained in the Livestock and Meat Industries Act (1934), all cold stores of over 2,000 cubic feet capacity and used for the storing of agricultural products, are subject to registration and inspection.

During the year under review 111 cold stores were registered as complying with the requirements of the Department that such places should be so equipped as to be suitable in every respect for the storing of products for human consumption. The Department is also continuing the inspection of cold stores already registered, in order to ensure that they are properly maintained, whilst advice is also rendered in regard to the improvement of unregistered cold stores in respect of which application for registration are still under consideration.

Registration of Fertilizers, Farm Foods, Dips and Stock Remedies.

During the registration year ended 31 December, 1945, 367 fertilizers, 731 farm foods, 223 stock dips and 381 stock remedies were registered in terms of the provisions of the Fertilizers, Farm Foods, Seeds and Pest Remedies Act (1917) and the regulations promulgated thereunder. On the 31 August 1946, the corresponding figures were 450, 854, 253 and 459 respectively. These figures indicate that the annual number of registrations is again increasing.

During the year ended 31 August 1946, 266 samples of imported fertilizers and farm foods were taken for analysis at the various Union ports and at Lourenco Marques. These samples all conformed to the requirements of the Act and the regulations issued thereunder.

Adulteration of Wine, Spirits and Vinegar.

During the year ended 31 August 1946, a total of 56 samples of liquor was purchased by the official buyer for analysis in terms of the "Wine, Spirits and Vinegar Act" (No. 15 of 1913).

The following table indicates the results of the analysis:—

Article.	No. of Samples Purchased.	Adulterated or below Standard.	Prosecutions (according to Samples).	Convictions (according to Samples).
Brandy.....	51	48	37*	15
Whisky.....	1	1	1	—
Wine.....	2	—	2*	—
Gin.....	1	1	1	1
Vinegar.....	—	—	—	—
	56	50	41	16

* Prosecutions in respect of the following have not been finally disposed of:—Brandy 9, wine 2.

In addition to the samples purchased for analysis, the official buyer also examined approximately 35,000 other samples and tested about 6,000.

In the case of imported liquors, 563 samples were analysed, with the following results:—

Article.	No. of Samples.	Below Standard.	Importations Refused.
Wine.....	218	17	17
Brandy.....	49	5	4
Whisky.....	73	3	3
Gin.....	44	10	7
Rum.....	16	4	4
Liqueur.....	148	28	28
Mixed Spirits.....	15	—	—
	563	67	63

Control of Imports and Exports.

During the past 12 months the control over imports of agricultural products and requisites in terms of the Emergency Regulations, was considerably relaxed and the prohibition of imports in respect of a number of articles lifted. The majority of articles which are still being controlled, are those under international allocation owing to their being in short supply throughout the world, while naturally, import restrictions are still being imposed on articles the importation of which is subject to supervision even under normal conditions.

In so far as exports are concerned, control is being continued under the Emergency Regulations, in respect of a large number of articles, mainly those placed under international allocation or in respect of which the Union in her own interests, cannot allow free export.

The shipping position, too, is gradually improving—a fact of considerable importance to the agricultural industry because of the leeway which has to be made up in respect of the importation of farming requirements.

Railage Rebate Scheme.

The railage rebate scheme which has already been operative for a number of years in respect of certain types of transport and which was extended on a large scale on 20 March 1939, was reviewed during the past year by a Committee consisting of representatives of the Railway Administration and the Departments of Finance and Agriculture.

The agricultural products and livestock on which the rebate was applicable, may be divided into the following four main groups:—

- (1) Livestock transported from drought-stricken areas to new pastures.
- (2) animal feed dispatched to farmers in drought-stricken areas;
- (3) livestock removed to markets and other centres; and
- (4) miscellaneous products being dispatched by rail or road-motor service.

The terms of reference of the Committee were to make recommendations in regard to the advisability or otherwise of further grants of rebates, in view of the changed economic conditions of the country.

ADMINISTRATIVE ACTIVITIES.

The Committee was constituted during October 1945, and submitted its report on all the aspects of the rebate scheme as it then existed, to the Minister of Transport on 26 March, 1946.

After considering the findings of the Committee, it was decided to withdraw as from 4 September, 1946, the temporary rebate on all products except maize and slaughter stock, which will be considered when the price of these products is fixed next year for the new season, and fertilizer which will be reconsidered at the beginning of the next financial year. The concessions in respect of the transport of livestock from and animal feed to drought-stricken areas still remain in force.

Seed Wheat and Fertilizer Loan Scheme.

Due to the serious shortage of wheat, which resulted in the imposition by the State, through the Wheat Industry Control Board, of stringent economic measures, it has been decided to make timely arrangements for the introduction of a loan scheme in respect of seed wheat and fertilizer in an endeavour to encourage an increased production. The wheat crops of the north-eastern Cape Province, the Orange Free State and the northern Transvaal were generally very disappointing during the previous season and many producers found themselves in a position where they could not even reap their seed requirements. In addition, they suffered such a set-back as a result of the drought, that they were not in a financial position to procure the necessary seed and fertilizer. In view of this state of affairs and the uncertain supply position which existed outside the Union, the Department was compelled to encourage maximum production and so reduce our import requirements.

Credit facilities were limited to an amount sufficient for acquiring 20 bags of seed wheat and 20 bags of fertilizer, repayable within a period of 12 months, with interest at the rate of 4 per cent. per annum. This scheme was made applicable to all districts where farmers were prepared to sow wheat and had reasonable prospects for a crop.

The scheme proved very popular and extensive areas were planted to wheat and, unless the absence of early rains in the northern areas causes the wheat to shrivel, it is presumed that the total yield will be considerably influenced by the relief scheme.

That our farmers have availed themselves of the scheme on an extensive scale is proved by the fact that the facilities were applied to 54 districts over the whole Union and that the Wheat Industry Control Board had to make considerable quantities of seed wheat available.

The Co-operative Movement.

During the year under review there has been no legislation directly affecting the co-operative movement, and there have been no important changes in the development of the movement which has rather been characterised by a steady growth, except in the case of co-operative trading societies, where the growth has been most marked.

At the beginning of the year there were 88 co-operative trading societies in existence with a total membership of 58,709, but the number of societies increased during the year to 116 with a membership of 65,769. Membership alone is quite unimportant in a study of the expansion of the movement but the trend in development is emphasized by the large number of additional societies registered during the year. These additional societies are mostly rural, and in each case the possibilities of successful operation were first considered and registration was sanctioned only after statistics had been furnished to indicate that the business prospects generally were such as to

warrant registration of the societies. The increase in the number registered is probably to a large extent due to the fact that farmers were well satisfied with the services rendered by their co-operative selling organizations, and that they consequently wished to extend this service to the field of buying.

The office of the Registrar of Co-operative Societies continues to function with difficulty due to a shortage of staff, which was, however, supplemented during the year and it is confidently expected that it will be possible to undertake at least some of the more urgent inspections of societies during the ensuing year.

Number and Membership of Societies.

At 30 June, 1946, there were 342 registered co-operative associations with a total membership of 226,763, representing an increase over the previous year of 33 in the number of associations and approximately 17,000 in membership. Of the societies in existence at that date, 226 were co-operative agricultural societies with a membership of 160,994, showing an increase of 7 in the number registered and about 10,000 in membership. The membership at the end of the previous year stood at 150,841. The percentage increase is high, and seems to indicate that farmers are well satisfied with the co-operative service which they now enjoy.

Business Statistics.

The net funds of all co-operative societies, represented by net share capital, reserves and unappropriated profits, have increased from £4,263,618 at 30 June 1939, to £8,576,060 at 30 June 1943, and to £11,023,206 at 30 June 1945, of which £10,057,912 represents funds of co-operative agricultural societies.

The total monetary turnover of all societies increased from £20,644,725 for the year 1938-39 to £39,573,685 for 1942-43 and to £53,678,168 for 1944-45.

The turnover of co-operative agricultural associations during 1944-45 amounted to £50,402,788 which shows an increase of £2,523,532 over the previous year. The recorded transactions undertaken by the co-operative agricultural associations comprised £43,537,449 in respect of produce sold, £6,644,848 in respect of farming requisites supplied, and £225,360 in respect of services rendered. The volume of requisites handled represents a substantial portion of the total increase in business done and amounts to approximately £1,500,000 out of a total increase of £2,500,000.

Protection and Export of Wild Birds.

During the past year 17 permits were issued in respect of 642 wild birds, with a view to enabling persons to sell, buy or to obtain or dispose of by barter, wild birds already in captivity. Apart from this number, 11 permits only were granted for the capture of a total of 795 wild birds, exclusively for zoological institutions in the Union, i.e. a total of 28 permits for 1,437 wild birds was issued under the provisions of the Wild Birds Protection Act (Act No. 22 of 1934).

During the same period the export of wild birds considerably decreased as can be seen from the fact that 7 permits were granted under the Wild Birds Export Prohibition Act (Act No. 6 of 1925) for the export of 198 birds only. At the request of the applicants one permit in respect of 2 birds was cancelled. All the birds were sent to acknowledged oversea zoological institutions.

Conservation of the Agricultural Resources of the Union.

J. C. Ross. B.A., M.Sc., Ph.D., Director, Division of Soil Conservation and Extension.

As a result of Departmental re-organization effected towards the end of 1945, the Division of Soil Conservation and Extension was brought into being by grouping together the following Divisional activities:—

- (a) Soil Erosion Services;
- (b) Weed Eradication Services; and
- (c) Extension Services.

The first two, concerned respectively with the administration of the various state-aided schemes for combating soil erosion and the application of the provisions of the Weeds Act of 1937, previously existed as sections attached to the now defunct Division of Soil and Veld Conservation, while the third was a constituent



A typical water conservation dam.

section of the former Division of Agricultural Education and Extension. The welding together of these three activities under one Division ensures proper co-ordination of services which deal with what are merely different aspects of the same fundamental problem, namely, the conservation of agricultural resources and the promotion of sound land use in farming.

The responsibility for the production of food and other raw materials, as well as for the conservation of our agricultural resources, rests in the first instance with the farmers of the country, but the State can and must help the farmer to use his land to the best advantage not only for himself, but also for the nation as a whole.

This is the motive underlying the creation of the new Division. It is in effect a field conservation and advisory service, the primary function of which is to maintain close contact with farmers all over the country and to co-operate with them in the development and application of farming systems and practices

which will lead not only to increased production, but also to greater stability of production, and at the same time guard effectively against deterioration of soil, veld and water supplies.

Decentralization on a Regional Basis.

The activities of this Division have been decentralized on a regional basis, for which purpose the Union has been divided into five main regions, each of which is controlled by a Chief Regional Officer, supported by a balanced team of senior conservation officials. This group of officials constitutes the organizing and planning committee for the region. It is given as much local authority as possible and carries out all the functions of the Division of Soil Conservation and Extension in the particular region. A prime requisite, of course, is that each region must be staffed with an adequate field personnel of extension officers—men who are in daily touch with the farmers and who do the actual work. Shortage of qualified and experienced personnel is the most critical issue at the moment. All possible steps are being taken to recruit and train men for this work, but this takes time and it is inevitable that some time will have to elapse before the peak development of soil conservation activity in the Union is reached.

It is a happy augury for the future that the people of the Union, urban no less than rural, have become markedly "conservation conscious" and are prepared to give their full support to a comprehensive national campaign of farming rehabilitation and soil conservation.

Main Provisions of the Soil Conservation Act.

The most outstanding achievement during the past year was the passing of the *Soil Conservation Act (No. 45 of 1946)*. This Act is the response, on the part of the State, to the nation-wide demand that has arisen for better provision for combating soil erosion and for conservation of the natural resources of the country in its soil, veld and water supplies. The main feature of the Act is that it provides legislative enablement for full co-operation between the State and the farming community, with a view to securing the application of farming systems and practices which will husband these assets for the benefit of present and future generations, and at the same time enhance the fertility of the land and increase the production from farming. It also establishes the basis of the financial assistance which the State will be prepared to grant to farmers for this purpose. In view of the far-reaching implications of this Act, it seems necessary to give a brief synopsis of its main provisions.

In drafting the bill, the model bill prepared and published by the National Veld Trust, and also the laws of other countries relating to the conservation of natural resources and various Union laws on related subjects, were consulted. The draft bill was referred to and discussed at several meetings of the Agricultural Advisory Board, and was also considered fully by a Select Committee of the House of Assembly.

Although the Soil Conservation Act applies to all land, existing legislation administered by different Government departments has not been disturbed, except that certain provisions of the Forest and Veld Conservation Act (No. 13 of 1941), relating to soil conservation, have been taken over and embodied in the new Act.

The Act does not create a special department or other organization for giving effect to its enactments or for the execution of works which may have to be undertaken by the State. Responsibility for the administration of the Act and any regulations thereunder rests

in the first instance with the Department of Agriculture and, more particularly, with the Division of Soil Conservation and Extension. Where soil conservation works or measures are to be undertaken or applied to land under the control of other departments, or of provincial administrations, it will be the function of the respective department or administration to give effect to the provisions of any scheme embodying such works or measures.

Soil Conservation Board.

The Act provides for the establishment of a *Soil Conservation Board* consisting of the Secretary for Agriculture as chairman (with an Under-Secretary as alternate), the Secretary for Lands, the Secretary for Native Affairs, the Director of Irrigation, the Director of Forestry, the Director of Soil Conservation and Extension, and nine other members appointed by the Governor-General, five of the lastmentioned to be *bona fide* farmers appointed from a panel of ten names to be submitted by the South African Agricultural Union, and the remaining four to be other persons appointed on account of their special knowledge of or experience in soil conservation. The functions of the Board will be to advise the Minister of Agriculture and Forestry on all matters relating to soil conservation and to perform certain specific duties allotted to the Board under various sections of the Act. These duties include, inter alia, the preparation of soil conservation schemes which it may consider necessary, or which may be required by the Minister; the examination of draft schemes referred to it; the inspection at any time of the operation of any scheme; the consideration of applications for the establishment of soil conservation districts and of proposals regarding the establishment of soil conservation areas; the making of recommendations regarding the expropriation of land, suspension of rights, or exemption from suspension or termination of suspension in a soil conservation district or soil conservation area; and the expropriation of land outside such districts or areas for purposes of the Act. The fact that representation is given on the Board to various State departments concerned with different aspects of land use and soil conservation, should ensure proper co-operation and co-ordination of effort among these departments.

Soil Conservation Districts.

The Act also makes provision for *soil conservation districts* and *soil conservation areas*. The former can originate only on the volition of the majority of owners of land in the area concerned, who must define the proposed area and furnish a list of the included properties, with the names and addresses of the registered owners and occupiers (inclusive of "bywoners"), and also give the reasons for the proposed establishment of the soil conservation district. Soil conservation areas, on the other hand, are proclaimed by the Governor-General, on the recommendation of the Board, in instances where the conditions demand action, but where voluntary action on the part of the owners of the land concerned is not forthcoming, or where it is evident that the necessary reclamation and conservation works will have to be undertaken mainly by the State at public expense. Subject to the payment of compensation, land may be expropriated where such action is deemed necessary for the purpose of reclamation, or for the prevention of soil erosion or sand drift, or for the protection of catchment areas or the conservation of water sources, and irrespective of whether the land concerned falls inside or outside a proclaimed conservation district or area.

District Committees.

A *soil conservation district committee* has to be established in respect of every soil conservation district, and shall consist of such number of members as the Minister may determine in each case, at least two-thirds of these to be occupiers of land carrying on *bona fide* farming operations in the district. The farmer members are elected by the owners of land in accordance with a procedure to be prescribed by regulation. The remaining members are appointed by the Minister and will, whenever practicable, include at least one technical officer of the Department to assist the committee, particularly with regard to the preparation of soil conservation schemes.

A district committee is required to prepare a soil conservation scheme for all land in its district and to obtain each owner's consent or his objections thereto. After due notice by the Minister, the scheme will be served on the owner concerned and applied to his land, and the committee will be required to take such steps as may be necessary to ensure the proper carrying out of the provisions of the scheme.

Application of Soil Conservation Schemes.

A *soil conservation scheme* is a comprehensive plan designed for the reclamation of eroded land or for the prevention of soil erosion, or, generally for the conservation, protection and improvement of soil, veld and water supplies, and includes all necessary measures for the promotion of sound systems and methods of land use. In order to attain this broad object, a scheme may include provisions relating to the works which are to be undertaken by the State and by the owner, respectively; the order in which the works must be constructed; the labour, equipment and material to be supplied by the State or by the owner; the soil conservation measures to be applied to the land and the order in which they are to be applied; the manner in which land has to be prepared for the growing of crops, including provisions regarding rotation of crops or strip-cropping; the temporary withdrawal of defined portions of land from cultivation or grazing; restrictions regarding the kind and number of livestock which may be grazed for specified periods on any part of the land; the occupation of the land by lessees, native labour tenants, squatters or servants; the prevention, control and extinguishing of veld and forest fires; or the treatment and management of forests and plantations, including the disposal of slash, debris or waste.

A scheme will generally allow sufficient elasticity to permit of its being carried out in a practical manner under varying conditions of climate or under varying circumstances. In addition to this, the Minister can, after consultation with the Board and the district committee concerned, amend the provisions of any scheme or grant exemption from any provision thereof, if he is satisfied that strict compliance with that provision will cause undue hardship to the owner or occupier concerned.

As regards land not falling inside a soil conservation district, the owner may himself, with or without technical assistance, prepare a soil conservation scheme and submit it to the Minister with the request that it be applied to his land. The Minister may reject the scheme or may agree to it, with such modifications as may be agreed upon between the Minister and the owner. The Minister may also, on the recommendation of the Board and after due notice to the owner concerned, cause a scheme to be prepared and applied to any land situated outside a soil conservation district.

An owner of land is bound to carry out the provisions of the

scheme applied to his land; in the event of his failure to do so, the Minister can, after consultation with the district committee, take such steps as may be necessary to carry out the provisions of the scheme and recover the cost thereof or any portion of such cost from the owner.

In order to assist an owner of land to construct approved soil conservation works or to carry out approved soil conservation measures on his land, the Act authorizes, subject to conditions to be prescribed by regulation, the payment of *subsidies* or *grants* to the owner concerned, or the granting of *advances* to such owner, with an appropriate *rebate* on the total sum repayable.

An additional provision of the Act is that the Minister is authorized at any time to take steps for the construction or maintenance on any land of such soil conservation works as he may, on the recommendation of the Board, consider necessary. The cost of works so undertaken may be charged entirely to the State, or entirely to the owner or owners of the land which is beneficially affected by the works, or partly to the State and partly to such owners. Where the owner or owners concerned are dissatisfied with the amount of costs charged to them, the matter in dispute will be decided by a board consisting of the local magistrate and two other persons, one to be appointed by the owner or owners and the other by the Minister.

For the purpose of *public demonstration or research* in matters relating to soil, veld or water conservation, the Department may at public expense construct any soil conservation works or apply any soil conservation measures on private land subject to the approval of the owner of the land and subject also to such conditions as may be agreed upon between the Minister and the owner.

Fire-protection Committees.

In order to make better provision for the protection of veld from fire or for extinguishing veld fires, the Act provides for the establishment of *fire protection committees*, whose functions are to be prescribed by regulation. The establishment of such committees and the areas assigned to them will be notified as necessary by the Minister in the *Government Gazette*.

The foregoing description will serve to indicate the comprehensive nature and wide scope of the new Act. It provides for every possible contingency that is likely to arise in connection with the national campaign of soil conservation and farming improvement now envisaged. All experience goes to show that the farmers of the country are eager to co-operate with the State in order to bring the campaign to a successful conclusion, and that coercion or compulsion is likely to be called for only in exceptional cases. For this reason it is confidently expected that the dominant approach to the problem from now on will be via the medium of soil conservation districts established on the volition of the farmers concerned and run essentially by the farmers themselves.

Notwithstanding the current shortages of personnel, labour, motor transport, machinery and equipment generally, as well as various difficulties experienced in the re-organization of the Division, it is pleasing to be able to report considerable useful progress during the year under review as regards soil conservation activity in the field. A summarized account of the activities of each section administered by the Division will be found under the appropriate heads.

Sectional Activities.

A. Soil Erosion Control.

In 1933 several schemes were instituted by the Government in order to assist owners and occupiers of land in the construction of small dams and anti-erosion works. The object of these schemes was to encourage the farming community to conserve water for both stock-watering and irrigation purposes, and to devote more attention to soil-erosion control.

As a result of the war and the consequent need for curtailment of expenditure, the granting of further facilities under these schemes was suspended in June 1940. In April 1942, the facilities were, however, partially restored and have continued in modified form up to the present date. There has been a tremendous increase recently in the number of applications received, due most probably to the return of men from the forces and the prevailing demand for increased agricultural production.

Under these schemes, no fewer than 24,811 dams, valued at £2,803,819, were completed up to 31 August 1946. Completed anti-erosion works have a total value of £407,241, which again brings to light the striking fact that farmers have shown a marked preference for the construction of dams which are intended primarily for the conservation of water and which are only of indirect value in soil erosion control. The same disproportion is also apparent in the estimated value of outstanding works, viz., £2,167,038 in the case of dams and £450,381 in the case of soil erosion control works.

A comparison of the average monthly figures for the years 1944-45 and 1945-46 in regard to "dams approved" and "dams completed" indicates very clearly that the amount of field work has almost doubled in the past year. Although the corresponding figures for soil erosion works do not show any marked increase, it may be mentioned that a steadily increasing volume of work of this nature is being done outside the schemes, i.e. without claims for State assistance. Apart from this, it should be noted that the surveying of contour systems, which represent the greater part of the usual soil-erosion works, requires much more field work per unit of cost than is involved in the surveying of dams.

Notwithstanding the fact that the Division has succeeded up to a point in obtaining additional personnel, the ever-growing waiting lists give clear evidence that the demand for surveys cannot be coped with and that the field staff will have to be strengthened considerably in order to give the farming community the service it requires even under these limited schemes alone. It may be noted that "outstanding" dams and erosion works, which have accumulated since the year 1933, amount to more than 50 per cent. of the approved total.

The construction of masonry structures suffered a severe setback during the year under review as a result of the shortage of cement and of the steel wire used for reinforcing purposes. In addition, most of the necessary machinery, such as windmills, engines and pumpheads, has been and still is in short supply. It must be presumed that many of these structures had a high priority in planned farm extensions, but that they had to be postponed in favour of more easily executable soil structures. This may in a way explain the tremendous increase in the number of applications for dams. The lack of machinery such as tractors, graders, bulldozers and ditchers, on the other hand, may be responsible for the continued slow progress in soil erosion works, such as contour-ridging and donga reclamation. Although such heavy machinery is indispensable if

fast work is to be done, it has been proved that well-shaped contour banks can also be built by systematic ploughing only, thus eliminating the danger of excessive capital investment. This ploughing method is gradually gaining popularity.

The great value of these schemes lies in the fact that they have to a large extent helped to make the farming community conscious of two important factors intimately affecting the agricultural industry. The first is the benefit to be derived from water conservation and the second, and more important, is the necessity for controlling soil erosion.

In this country, where the destruction caused by soil erosion has already reached vast proportions, it is clear that *reclamation* measures will have to play a very big rôle for many years, but in the long run *prevention* of erosion will have to be regarded as the most important line of attack on the problem as a whole. Full cognizance has been taken of this fact in the "conservation scheme" approach envisaged under the Soil Conservation Act. As this new method of approach gains ground, it may be expected that the need for the existing soil erosion schemes, with their restricted scope, will gradually fall away, and the same applies in respect of the *silo scheme*.

This scheme was inaugurated in 1936 with a view to encouraging farmers to devote more attention to fodder-conservation, notably in the form of ensilage. The scheme originally applied to maize growers only, but the facilities were later extended to all farmers in the Union, and the Department paid a bonus of 25 per cent on the final valuation of silos built under the scheme. During the past year an amount of £4,740 was paid out in bonuses.

Conservation Areas.

The war period 1939-45 marks the period of the awakening of the people of South Africa, both rural and urban, to the facts concerning soil erosion and the need for conservation farming. Before 1939 these matters were considered seriously only by a minority of farmers and a very small percentage of townspeople. By the end of 1945, however, large numbers of both farmers and townsfolk were clamouring for action to be taken to secure the rehabilitation of areas damaged by soil erosion and generally to ensure the conservation of the agricultural resources of the country. The colour film "South Africa in Danger", shown in many parts of the country, played an important part in arousing the interest of the people and especially of city dwellers.

A particularly significant development during the war period was the passing of the *Forest and Veld Conservation Act*, (No. 13 of 1941), which embodied the first attempt to provide effective legislation to deal with soil erosion and related problems. Under this Act the Government is empowered to proclaim as a "conservation area" any area of land which is considered, in the national interest, to warrant reclamation or conservation at public expense, together with such additional land as may be required for the proper conservation of the area in question. When a conservation area has been duly defined and proclaimed under the Act, the Government is empowered in respect of *any land within the area*—

- (a) to expropriate such land, subject to a right of pre-emption remaining in the owner or his successor in title; or
- (b) to suspend for a specified period any or all of the owner's rights in or over such land, and to enter upon and take possession of the land for the purpose of conservation; or
- (c) to grant exemption from suspension of rights to any owner who undertakes to carry out at his own expense

such conservation works as may be prescribed: this exemption may be terminated at any time, subject to three months' notice, and may be withdrawn without notice if the owner fails to comply with the terms of his undertaking; and

- (d) to restore in due course any rights that may have been suspended, subject to payment by the owner of a sum representing the improved value of the land after reclamation, and further subject to such conditions regarding the future occupation and use of the land as the Government may deem fit to impose, which conditions shall attach to the land and be noted on the title deeds: in the event of the owner's failure to pay the amount due within a stipulated period, the land shall forthwith vest in the Crown, subject to payment of compensation equal to the value of the land before reclamation plus the value of improvements effected in the meantime by the owner.

It is clear that this Act gives the Government wide powers to enforce the reclamation and conservation of all land falling within a proclaimed conservation area. In actual fact, however, the policy has been to keep the "compulsion" aspect in the background and to make every attempt to secure the goodwill and co-operation of the landowners concerned.

Thus, in the areas so far proclaimed, expropriation of land has been restored to only in extreme cases; that is, where the national interest demands the suspension of farming operations on certain farms or portions of farms for an indefinite period. In such cases the landowners concerned are notified in writing. Should no agreement be arrived at as regards the compensation offered, the amount is fixed by an arbitration court consisting of the local magistrate, a representative of the owner and a representative of the Minister of Agriculture. Notice must be given to the landowner concerned not less than three months before expropriation takes place, but the Government is entitled to enter upon and take possession of the land within a period of six weeks from the date of service of the notice. The land thus expropriated is reclaimed at the expense of the State. In the event of the land being again released for farming at some future date, the dispossessed owner or his successor in title has the first right of purchase.

Similarly, the policy up to the present has been not to make use of the power of suspending an owner's rights in or over his land, unless all other methods of approach fail. In place thereof, the landowners are invited to co-operate with the Department in the application to their properties of reclamation and conservation plans that will ultimately achieve the objectives aimed at in the proclamation of a conservation area. To this end, special subsidy schemes have been called into being: landowners who carry out the prescribed works and measures at their own expense receive a cash bonus equal to 50 per cent. of the final valuation thereof, subject to a specified maximum; where ready cash is lacking, substantial loans are granted on very easy terms, the amount repayable being reduced by a sum equal to the bonus calculated as above.

A further important feature of the present conservation area approach is that the Department itself accepts full responsibility for the construction of certain works of a more difficult or costly nature. These are works which form an essential part of the whole programme of reclamation and conservation for the particular area and which cannot be regarded as the responsibility of particular individuals.

As far as soil conservation legislation is concerned, the *Forest and Veld Conservation Act* has now been replaced by the new *Soil Conservation Act* (No. 45 of 1946), the main provisions of which have already been referred to. The latter Act incorporates the relevant provisions of the former Act, but it also provides for various alternative methods of approach and covers a much wider field than the older Act. The new Act, however, has come into operation only very recently, and in the meantime several conservation areas have been proclaimed under the former Act. A brief description of the existing conservation areas follows.

(a) The Vlekpoort Conservation Area.

The upper reaches of the Vlekpoort River valley, comprising approximately 80,000 morgen, were the first to be proclaimed as a conservation area. The proclamation appeared in the *Government Gazette* of 22nd August, 1941.



A conical dam to catch silt (Vlekpoort).

Veld deterioration and erosion had reached an advanced stage over a great part of this area. A large proportion of the silt deposited in Lake Arthur was derived from farms in the Vlekpoort Valley, where extensive donga formation had already taken place and was progressing at an ever increasing rate. For these reasons this area was chosen as the first to receive special attention.

Along the lines already indicated, a method of approach was evolved which aimed at securing the whole-hearted co-operation of all the landowners concerned, so that by their efforts, combined with those of the Department, the area might be reclaimed in the shortest possible period and conservation farming methods introduced to ensure the improvement of the veld and the reduction of erosion to a minimum. The main features of the work done at Vlekpoort are as follows:—

Works Undertaken Departmentally.

Expropriated land.—The farm Uyenhoek, hardly a single morgen of which was unaffected by erosion, was the first to be acquired and served as local headquarters for the conservation officials seconded to the area. Work here commenced early in 1942. A comprehensive programme of reclamation work was started and gradually extended

to certain adjoining farms which were subsequently acquired, viz., Sonneskyn, Spitskop and Sarnia, and the near-by farm Caskieben, which consisted mainly of mountain veld infested with renoster and harpuis bush.

In the upper portion of the valley the properties of five owners have been taken over and those of three more owners are being acquired, while one farm at the lower end of the area is also being acquired. This will complete the land-buying or expropriation programme.

A large amount of reclamation work has been carried out on these farms and the major portion of the works on the Uyenhoek group of farms has been completed. Apart from the ordinary type of earthen embankment a number of different types of masonry and concrete structures have been and are being erected. Some of these structures are comparatively cheap and promise to reduce reclamation costs appreciably.

A vast amount of silt has already been retained on the farms concerned as a result of these works. Grasses and other plants are being tried out on these silt beds. So far the locally obtained "fluitjies" reed (*Phragmites communis*) is the most promising. It is remarkably hardy, binds the silt very thoroughly and spreads rapidly, thus inducing further deposition of silt as the reed spreads upstream. This reed has now been planted on many silt deposits.

During the past two years some power machinery was obtained, which made it possible to increase the number of gangs employed, especially as ex-volunteers became available for posts of foremen and drivers. Earth-moving work could thus be expedited, but unfortunately the scarcity of cement is still greatly retarding masonry and concrete work.

Although a large amount of work has been done with animal draft, it is quite clear from experience at Vlekpoort that heavy machinery will have to be employed on a large scale if satisfactory progress is to be made with the vast amount of work still to be tackled over the country as a whole. It is hoped that the necessary machinery and implements will become available in the near future.

Due to scarcity of fencing material, it has not been possible to complete the fencing programme on the farms mentioned. Nevertheless, stock was completely withdrawn from those portions where erosion had advanced furthest and where the veld had been damaged most, especially against the mountain slopes. The recovery of severely denuded veld has been disappointingly slow, even where such veld has been completely spared for two or three seasons. It must, however, be pointed out that the past two summer seasons have been very severe, in that very high temperatures prevailed, while little rain fell during the months best suited for rapid growth. But notwithstanding these adverse conditions, veld which had not been damaged too severely and where a fair amount of the topsoil still remains in place, has shown an encouraging improvement. It has thus been demonstrated very clearly that timely measures must be taken to reclaim the veld that has been mismanaged and is now on the way to complete denudation.

Attempts have been made to hasten the revegetation of denuded areas by sowing a variety of grasses, but little success has been achieved so far. *Cenchrus ciliaris* and *urochloa* have survived and may serve the purpose when better seasons are encountered. The local hardy creeping saltbush is also giving promise, while even a weed, the Russian tumble-weed which is extremely hardy, is being used to advantage as a pioneer on some of the hard, bare brak places where nothing else will grow.

On the farm Caskieben, 1,000 morgen have been cleared of renoster and harpui bush during the past year, but due to adverse climatic conditions very little veld improvement is noticeable as yet.

Weirs.—It was decided that a number of weirs of suitable type must be erected at strategic points across the Vlekpoort River and its main tributaries. The object aimed at is to induce deposition of silt above the weirs and thereby raise the level of the beds of the rivers and of the dongas in the immediate vicinity, to raise the water table, to reduce the drainage of the neighbouring countryside and to prepare the area generally for the application of appropriate veld reclamation and conservation projects.

The Department of Irrigation agreed to undertake the construction of the larger weirs and during the past year completed the fifth weir across the Vlekpoort River on the farm Ebenezer. The sixth weir is now in course of construction.

River betterment works.—These include works and structures designed to reduce the undermining and scouring of river banks, to induce the rivers to flow along the least dangerous course, to eliminate dangerous bends, and generally to stabilize the banks along properly confined water courses.

Palisades and groynes constructed with the aid of 8-ft. wooden poles driven 4 ft. into the river bed and firmly tied together and anchored, could not withstand the force of the water and were torn out and washed away. Some concrete structures have since been erected and others are in the course of construction.

Reclamation of main drainage channels.—These are large and well-developed donga systems, often miles in length and seriously affecting the stability not only of particular farms, but of the area as a whole. Their reclamation, in the nature of the case, is essentially work which must be undertaken at State cost. The building of substantial structures in the main channels is necessary: a number of these have been completed and others are in course of erection.

“Major” works on private land.—Under this head are included works which must be undertaken on many farms for the benefit of these particular farms, but which, by reason of their difficult nature or high cost, or both, cannot be undertaken by the landowners concerned. Such works are undertaken by the Department, and the landowners whose properties are beneficially affected are in due course required to contribute towards the cost on the basis set out in section 5 (4) (c) of the Forest and Veld Conservation Act, 1941, [now section 27 (3) (c) of the Soil Conservation Act, 1946]. It is to be noted that the undertaking of this work by the Department generally involves the temporary suspension of the owner's rights over the particular area concerned.

Before at least a few tractors became available it was virtually impossible for the Department to do anything under this head, but during the past year five well-equipped gangs have been assembled and the work is now proceeding.

Works Undertaken by Landowners.

The works undertaken by landowners, often referred to as “minor” works, are supplementary to the abovementioned works undertaken by the Department and embrace various mechanical works and biological measures designed to promote sound land use and the development of a stable farming system in respect of every farm. These works include soil erosion control works, farm dams, silos, adequate provision of grazing camps and all necessary measures for the reclamation and conservation of the soil, veld and water supplies, as also measures for ensuring the production and storage of increased fodder supplies.

In every case the plans and specifications are prescribed by the Department in consultation with the owner. Upon satisfactory completion of the work, the landowner receives a generous bonus on the valuation as determined by the Department, subject to the proviso that he must agree to maintain the works and to continue to apply the prescribed soil and veld utilization methods. Alternatively, as explained earlier, he may avail himself of the liberal loan facilities provided in which case an amount equivalent to the bonus he would have received (had he carried out the whole programme of work at his own cost) is applied as a rebate on the sum repayable to the State.

Most of the landowners have made very good use of the facilities offered and have done a considerable amount of very useful work, although progress generally is not as rapid as it might be. During the year under review 92 works of various descriptions have been surveyed on 26 different farms: of these, 58 have been completed and the remainder are in progress.

The farmers are particularly interested in the erection of fencing to sub-divide their veld property into camps, but little could be done in connection with this most important phase of the work, as fencing material is still practically unprocureable.

(b) The Tarka Conservation Area.

The Vlekpoort Conservation Area constitutes only about one sixth of the whole catchment area of Lake Arthur. Conditions in the whole catchment are alarming. Overstocked and denuded veld, accompanied by advanced donga and sheet erosion, are of general occurrence. Useless vegetation such as renoster, harpius and bitter karoo bush, as well as thorn bush and prickly pear, has already colonized portions of many farms.

The only lasting solution to the problems that have already been created is to be found in the reclamation of the soil and veld already damaged and the development and application of suitable farming systems, which together will result in a progressive improvement of farming conditions and permanent conservation of the soil, veld and water supplies. In order to achieve these objectives, the whole catchment area, comprising approximately 500,000 morgen, has recently been proclaimed a conservation area. This implies that the scheme for the Vlekpoort Conservation Area, already discussed, has now been extended to the whole of the catchment of Lake Arthur, but with two important additions:

- (i) *Eradication of useless bush.*—In view of the special nature of this work, the technical difficulties associated with it and the special equipment required, the Department will in many cases be compelled to undertake the eradication of useless bush and prickly pear. The landowner will be required to enter into an agreement to contribute 50 per cent. towards the cost in the same manner as, and subject to the same conditions under which, loans are repayable. It should be noted that provision has also been made for landowners, where possible, to carry out the work themselves under the bonus scheme.
- (ii) *Minor works undertaken by the Department.*—In cases where the landowner, because of labour shortage, or difficulties in regard to supervision, or scarcity and high prices of implements, finds it difficult or impossible to carry out the prescribed programme of minor works himself, he may request the Department to carry out this work on his behalf. Should the Department deem it

expedient to accede to his request, the landowner will be required to pay to the State an amount representing 50 per cent. of the valuation of the completed works. This payment is subject to the same conditions applying in respect of loans and is recoverable in the same manner.

(c) The Drakensberg Conservation Area.

An area comprising approximately 1,000,000 morgen of land, bounded by the Tugela and Mooi Rivers in Natal, was proclaimed as a conservation area in the *Government Gazette* of 14 April, 1944.

In this area the application of unbalanced farming systems, as well as various land-use malpractices, including the pernicious labour-tenant or "labour farm" system, and other factors have led to extensive land deterioration, with the result that erosion of every type is rife.

These conditions have led to widespread denudation of the veld and depletion of soil fertility, and have had such a profound influence on the stream flow of the local rivers that, during the drought of 1933, most of the rivers of this once well-watered area were practically dry. If this state of affairs were allowed to continue, these once permanent rivers would inevitably become dry beds in the winter and roaring torrents with every heavy rain in summer, and ultimately all farming in the area would be jeopardized.

For these reasons the Government decided to take action to remedy the situation and, as a first step to this end, the area concerned was proclaimed a conservation area. With a view to ensuring effective reclamation and conservation of the proclaimed area and assisting farmers to apply correct farming systems in order to stabilize farming in the area, a scheme very similar to that described for the Vlekpoort and Tarka Conservation Areas has been inaugurated.

In the early stages progress was very slow, due to shortage of staff, as well as of essential machinery and implements. These conditions have now improved somewhat and better progress is being made, although it is still far from what it should be. The main features of the work completed and in progress are as follows:—

Works Undertaken Departmentally.

Under the *expropriation* programme three adjoining farms, which form the headwaters catchment area of the Blaauwkrantz River, have been acquired with a view to safeguarding this important water source. Immediate attention was given to reclamation of the extensive dongas on these farms. During the year under review 32 concrete and stone masonry barriers, as well as 20 earthen embankments, were constructed to this end.

A heavy tractor with bulldozing equipment has been used very effectively for sloping the perpendicular sides of dongas. These are then covered with a layer of grass, which is cut at a stage when the seed is ripening. Most encouraging results are being obtained, for the seed germinates well and the indications are that the banks will soon become densely grassed.

The recovery of denuded veld after one summer season of sparing, notably against the mountain slopes, has been very much more encouraging than in the Vlekpoort area, where the rainfall is lower and more erratic, and soil conditions are poorer.

Major works have been undertaken at State cost on five private farms. Most of this work has been completed and here, too, results are being obtained more quickly than at Vlekpoort. Denuded areas are effectively and quickly revegetated by fencing them off and retarding the rapid drainage along dongas by means of barricades.

The fencing in of vleis where dongas are developing, coupled

with the use of concrete, masonry or earthen banks, is also proving an effective method for the reclamation of such vleis and their restoration to the marshy sponges they should be.

A good deal of attention has been given to *bush eradication*, as the thinning out of bush in the thornveld area is an essential preliminary to the restoration of such veld and the combating of erosion. An air-compressor, equipped with various types of chisels, is being tried on this work. Over 100,000 trees have already been felled and it would appear that with some further improvements this method of eradication is likely to prove successful. The felled bush is used to great advantage for covering bare patches in the veld, thereby inducing revegetation, and also for the reclamation of small dongas.

Works Undertaken by Landowners.

During the year under review 45 farmers applied for assistance under the subsidy or loan-plus-rebate schemes referred to earlier, in order to enable them to carry out approved programmes of minor works on their farms. This brings the total number of applications so far received to 125. It has not been possible to deal with all these applications, for reasons already indicated. In actual fact, detailed plans and specifications have been prepared for only 32 applicants so far; a good deal of this work has been completed and the rest is in progress.

(d) The Heuningklip River and Tygerberg Conservation Areas.

These two areas have been proclaimed very recently as conservation areas, and similar facilities are being made available as in the case of the other areas. Work in these areas has not yet commenced.

The Heuningklip River Conservation Area comprises approximately 50,000 morgen in the Sterkstroom district, eastern Cape Province, and the Tygerberg Conservation Area roughly 10,000 morgen in the upper portion of the catchment of the Elsieskraal River in the Bellville district, near Cape Town.

B. Weed Control.

Prickly Pear Eradication.

The Division is happy to be able to report that the prickly pear eradication campaign in the eastern Cape Province is now virtually completed. Prickly pear felling was started on 30 August 1943, as an experiment. Italian prisoner-of-war labour was utilized. This labour was dispensed with on 1 April 1944, as it was found uneconomical, and native labour was substituted. The scheme was started at Cookhouse and was later extended to Graaff-Reinet. The experimental felling was found to be so successful that it was decided to extend felling operations to cover all prickly pear in the eastern Cape Province area which had been reserved for the biological control of prickly pear.

Two new felling schemes known as the "Departmental felling scheme" and the "subsidy felling scheme", were formulated and came into operation in place of the experimental felling scheme on 8 June, 1946. Under these schemes the following areas of prickly pear have been felled:—

Experimental felling scheme.....	32,000 morgen.
Departmental felling scheme.....	147,786 morgen.
Subsidy felling scheme.....	246,202 morgen.
TOTAL	425,988 morgen.

The average labour cost per morgen under the Departmental scheme, which can be taken as the basis of calculation of costs for both schemes and is the figure on which the contribution of the landowner is based, worked out at 6s. 2d. per morgen.

The results achieved in almost all areas dealt with have been most gratifying, and it can be stated confidently that the prickly pear menace in all the more important farming areas is now a thing of the past. There are, however, areas where, owing to climatic conditions, the fungus disease *Empusa* and certain cochinelid parasites have thrived at the expense of the cochineal, and where the felling method of eradication consequently could not be used or has not been wholly successful. In the areas in which prickly pear has been felled there are fortunately very few places where severe regrowth has occurred or can be expected. These places are being kept under close observation.

For the reasons stated, the felling method could not be employed in the following areas: the districts of Ilumansdorp, Port Elizabeth, Alexandria, Bathurst and the coastal portion of Uitenhage. In these areas it is proposed to liberate the prickly pear parasite *Cactophagus*, which is at present being bred up at the Uitenhage Cactoblastis Station, in the hope that this insect will be able to deal effectively with the prickly pear in the areas mentioned.

It is proposed to terminate the prickly pear felling schemes on 30 June 1947. The present area reserved for the biological control of prickly pear will be reduced to include only areas mentioned above in which the *Cactophagus* insect will be used to control pear. In the rest of the Union prickly pear will then become a proclaimed weed under the Weeds Act and any owner of infested land who has not availed himself of the facilities offered under the felling schemes will be compelled to eradicate prickly pear occurring on his property at his own expense.

Consideration is being given to the question of extending the scope of the felling schemes, which are at present applicable only in the biological area, to certain areas of the northern Cape Province and southern Orange Free State which fall outside the biological area. In these areas cochineal has developed so satisfactorily that it is considered that the felling method of eradication may be applied. It is hoped to induce all landowners in these areas to make use of the subsidy felling scheme, in order to avoid the necessity of having to transfer labour gangs from the eastern Cape Province.

Considerable quantities of prickly pear occur in the Ciskei, and these infestations are a menace to adjoining districts. As the Ciskei is all native territory, administered by the Department of Native affairs, it has not as yet been possible to undertake any eradication there. Representations have, however, been made to that Department in respect of this pear, and it has been suggested that this Division undertake eradication under the departmental scheme.

Spineless Cactus.

A serious situation has arisen in many parts of the country in regard to spineless cactus. Cochineal has now spread to practically all parts of the Union and has attacked many spineless cactus plantations, the indications indeed being that most spineless cactus plantings in the country will in course of time become infested.

Protection can be afforded (a) by removal of all scattered growths of pest pear which the cochineal uses as stepping stones to move from place to place, and (b) by establishing a method of controlling

cochineal in spineless cactus. In connection with (a), it must be stated that field officers have been instructed to apply the Weeds Act more strictly in respect of prickly pear, and the campaign against prickly pear will be intensified after 30 June next, when the felling schemes have been terminated and the major portion of the present biological area has been abolished. As regards (b), the Division of Entomology is experimenting with methods of controlling cochineal and has devised a D.D.T. emulsion which is promising.

Prickly pear has long been a major menace over a large area of the country, but is now fast disappearing. It is hoped to have the remaining growths eradicated in the relatively near future, to ensure the protection of growers of spineless cactus, and to eliminate entirely the threat of any part of the country becoming infested with pest pear in future.

Other Noxious Weeds.

During the past year the control of noxious weeds has been vigorously prosecuted in all parts of the country, although lack of staff and the consequent huge areas which had to be allocated to each Weed Inspector have limited the progress made. Generally speaking, however, a distinct improvement as regards the majority of the proclaimed weeds can be reported in most areas. Inspectors report that the continued propaganda made in respect of weed eradication is gradually having effect.

State assistance was again provided during the year in respect of portions of the Vaal River and a number of badly infested rivers in the Northern Transvaal. It is not yet possible to determine when weed eradication along these rivers will have been brought to a stage where State assistance will no longer be necessary and the onus of maintaining the river banks free from weeds can be thrown on the riparian owners.

Control of *dodder* in the lucerne seed-producing areas has been intensified, with good results. The seed regulations promulgated in the course of last year are undoubtedly having excellent results, from the dodder eradication point of view. It has become increasingly clear, however, that regulations prohibiting the sale and transport of lucerne hay infested with dodder are urgently necessary in order to prevent the spread of this serious weed.

The spread of *upright star burr* in the bushveld areas of the Transvaal is causing concern. Owing to the abundance of seed formed by this troublesome weed, the drought resistance it exhibits, and the fact that its seed germinates readily with light showers of rain, it has invaded large areas. It is a weed which normally invades only ploughed lands or disturbed ground, but has been found to invade large tracts of veld during the past two years. This is largely due to gross over-stocking coupled with severe drought. The position has become so serious that a special campaign is being undertaken to ensure control of this weed.

During the course of the year a survey of *hakea* infestations in the south-western Cape Province was undertaken. The survey revealed a very serious state of affairs and consideration is being given to the inauguration of a special scheme to bring this weed under control.

No active steps to combat *jointed cactus* have been taken during the year, although the situation has been kept under observation. Considerable regrowth of jointed cactus has taken place and the general position in respect of this weed can be described as deteriorating rapidly.

Two new plants have been proclaimed weeds in the course of the year, viz. *Lantana camara*, also known as *tickberry*, and *cenchrus viridis* or *burr grass*. *Lantana* is becoming a serious menace in certain coastal districts of Natal and has already invaded some 25,000 acres of valuable land in those parts. *Burr grass*, a newcomer to South Africa, and as yet known to occur only in a limited area at Durban, is a dangerous weed and it is felt that it must be controlled at the outset. Active steps to ensure eradication of these weeds are being taken.

Bush Eradication in Zululand.

At the request of the Division of Veterinary Services, this Division has undertaken an extensive bush-clearing campaign as part of the various measures now being adopted to combat nagana in Zululand and adjoining areas.

Briefly the work entails: (a) the clearing of all bush, thicket and trees in barriers two miles wide around the game reserves in Zululand, which are considered to be the main breeding foci of the tsetse fly, (b) the isolation, by means of similar barriers, of other breeding places of tsetse fly which occur outside the game reserves, and (c) discriminative thicket clearing with a view to rendering a number of suspected breeding places unsuitable for fly breeding. A rough estimate of the areas to be cleared of bush in the so-called barrier-clearing is 120,000 acres.

Bush clearing on an extensive scale has been undertaken by the Division of Veterinary Services on Crown land and by the Department of Native Affairs in native reserves. The understanding now reached is that all labour previously employed by the Division of Veterinary Services will be taken over by this Division and, similarly, that all bush clearing in native reserves will be taken over by this Division as soon as the necessary organization can be established. All labour of the Division of Veterinary Services was taken over by this Division from 1 August of this year.

In view of the difficulty and delay in obtaining equipment, this Division has not yet been able to take over bush clearing in native reserves, but expects to be able to do so shortly when bush-clearing equipment on order comes to hand and the best and most economical method of operation has been determined. It is hoped to have the technique established within the next two months, when this Division will assume responsibility for all bush clearing in Zululand.

The intention is to mechanize bush clearing as much as possible with the object of expediting the work and doing it more economically. The greatest difficulty has been experienced in obtaining the necessary machinery. It has been ascertained that bulldozers, which would be most valuable for doing rapid clearing of thicket in flat country, will not be available for at least another 18 months. The Division has been successful in acquiring five portable air compressors, and these machines have proved most useful in digging out light trees and bush at the Drakensberg Conservation Area, where they have been extensively used. They have not so far proved capable of dealing with large trees in Zululand, but appear to be able to deal effectively with thickets. Hand operated Australian monkey winches (stump-pullers) have been ordered and will be able to deal with large trees.

Recently an agreement was entered into with a private firm to put their tractor-operated stump-pullers on trial for a period of

two months. The trial will demonstrate the value and economy of the machines under conditions existing in Zululand. If the claims of the firm are substantiated, it is possible that the whole policy of bush clearing will be altered and that an agreement will be concluded with the firm to undertake the whole job.

The bush-clearing campaign in Zululand is as yet in its infancy, but should be well under way within the next few months. It is hoped from the experience which will be gained in Zululand to be able to formulate schemes and build up the nucleus of an organization to deal with the highly important problem of bush encroachment in various parts of the Union.

C. Extension Services.

(1) District Extension Work.

The extension officer is a specialist who must be intimately familiar with the area he serves and the farming carried on therein. His main functions are to maintain close contact with the farmers of this area, to co-operate with them in the development of farming systems and practices that are suited to the local conditions and to furnish them with all the necessary technical advice in this connection. Broadly speaking, his aim is to promote both increased production and greater stability of production from farming in his area, with due regard to all the necessary measures to ensure the proper conservation of soil, veld and water resources.

Besides assisting the farmer to obtain and make practical use of the results of research and experimentation, he brings to the notice of the rest of the Department, including the research workers, the problems and the needs of the farmer. He therefore constitutes the indispensable link between the farmer and the Department. With his scientific background and his close contact with practical farming, he develops a thoroughly practical, but none the less scientific, outlook on the problems of farming, which wins him the confidence of the farmers in his area and enables him to persuade them to put into practice the advice of the Department.

Unfortunately the number of extension officers is at present so small, and consequently the area served by any one officer so large, that they are able to devote but little time to real extension work. For, in addition to their extension duties, they are saddled with an enormous amount of regulatory work in connection with bull inspection, seed potato inspection, soil erosion and silo schemes, and the like.

The Department is determined, however, to expand this service to an extent commensurate with its value and scope, which will henceforth include numerous additional duties arising from the coming into operation of the new Soil Conservation Act. The areas served by these officers will have to be reduced to an extent that will enable them to attend to the needs of every farmer in the country. Furthermore, it is intended to provide them with technical assistants to assist them in work of a more or less routine nature, so that they may be able to concentrate more on farm planning and advisory services.

In the year under review there were only 37 extension officers in the field to serve over 100,000 farmers. The following figures of some of their main activities during the past year reflect the extent of the services they were able to render to farmers: personal visits paid to farms, 13,213; different farms visited, 10,696; farmers' meetings attended, 1,230; lectures and demonstrations given, 1,580 (total

attendance 29,733); field demonstrations conducted, 2,504 (total attendance 18,671); animals handled in advisory capacity, 49,705 cattle, 68,765 sheep, 2,741 pigs, 1,313 horses, 18,371 head of poultry; bulls inspected, 12,808; letters written to the public, 11,923; office interviews with visitors, 13,515; farmers' tours organized, 17 (participants 380); shows at which extension officers acted as judges, 30; soil erosion inspections and surveys carried out, 3,333; mileage of contour-banks marked off, 1,497; applications for silos handled, 315, and inspections made in connection therewith, 164; articles written for *Farming in South Africa* and the Press Service, 17.

Although these figures are not unimpressive, they reveal none the less that the extension service, at its present strength, is touching little more than the fringe of the country's farming and soil conservation problems.

Agricultural Clubs.

It is axiomatic that when one has an educational task to perform, the earlier one begins it in the life of the people, the longer period they will have in which to use the education offered and thus the more effective it will be. For this reason the Department has from the outset given youth a significant part in the extension programme. Nearly 34,000 juveniles from 10 to 18 years of age are reached through the agricultural club movement.



The Agricultural Club leader tells how J. Smal, seated in the foreground, produced 35½ bags of maize per acre.

The requirements for membership of these clubs is that each boy or girl enrolled must undertake a project or demonstration showing the better way in some farm or home enterprise, such as growing maize; gardening; raising pigs, poultry, beef cattle, or dairy animals; sewing, interior decoration and furnishing; canning and preserving food; or collective land service work.

The clubs hold monthly meetings at which the members discuss the progress of their projects, and also mix socially. They exhibit their products on "achievement" days and at agricultural shows.

All officers of the extension and home economics services are required to promote agricultural extension work through the agency of youth. Owing to the large number of families in each extension

officer's area, it is necessary to enlist the co-operation of competent farm men and women, teachers, ministers and others to guide the agricultural club movement. These lay leaders, often high school college graduates, have been of invaluable assistance. The extension officer gives them a measure of training and the local leaders then extend the information to the respective youth groups.

Objectives.—Club work is helping to develop rural leadership by encouraging rural youth to undertake important work in the way of demonstrations on the farm and in the home and community, to maintain a record of their work, to exhibit and explain it to others and to draw up final reports. It encourages young people to develop and stage plays and pageants, shows and achievement days, establish bands and choruses, and arrange debates, camps, picnics and other social events that add pleasure, culture and interest to rural life.

Club work is also helping to make rural youth conscious of the privileges and the inherent beauties of rural life, as well as of the contribution which it can make to the economic and cultural life of both country and town.

Achievements.—The movement continues to flourish. The war certainly impeded its progress, but even during the war years rapid growth took place, which indicates clearly the wide appeal of the agricultural club idea. Since 1940 the club movement has been publishing its own magazine; at first the title was "Joy In Doing", but in November 1943 this was changed to "Pro Patria."

During the past year 9,309 club members devoted no fewer than 3,000,000 hours to club work on their own plots and farms, or on other farms. At fourpence per hour this represents labour to the value of £50,000, equivalent to the work of 4,654 ordinary farm labourers. The value of their produce amounted to approximately £200,000. The average production of maize by 500 members over the past few years is about 11 bags per acre, as compared with a mean yield of 3·7 bags per acre for the Union and 5·3 bags per acre for the high veld of the Transvaal, the best area, these figures being taken from the latest report of the Agro-Economic Survey.

Four provincial club camps were held during the year for the instruction, entertainment and recreation of club members. Camps were also held for the purpose of land service—combating soil erosion, assisting farmers with the reaping of their crops, and the like. By these efforts club members have kept well abreast of modern farming developments and new ideas.

There is no better way for young people to begin their study of the art and science of farming than to become members of agricultural clubs. This is the only youth organization concerned primarily with the land.

Even if farming is not to be the chosen calling of the club member, the boy or girl will at least have learned something about the conduct, management and control of affairs in the farming world, and the knowledge and experience gained will unquestionably prove most useful in later life. The movement provides an interesting, realistic and profitable means of education in agriculture, without the necessity of taking a course at an agricultural college.

During the year under review the officers detailed for club work paid 1,021 visits to clubs and farms, conducted 1,892 inspections

at places where the projects were carried out, attended 420 meetings, arranged 10 cinema shows, and gave 201 lectures and demonstrations which were attended by 32,234 persons (children, parents and teachers). A total of 6,862 boys and girls from 215 different schools participated in individual and other projects as follows: vegetables, 1,920; flowers, 65; wheat, 17; potatoes, 47; maize, 520; fruit, 27; poultry, 210; calves, 94; sheep 41; pigs, 37; ox-fattening, 10; homing pigeons, 130; bird protection, 47; judging cattle, 48; judging sheep, 42; judging poultry, 65; judging pigs, 41; buttermaking, 30; woolwork, 101; sheepskin work, (girls) 15; sheepskin drying, 185; tanning, 27; needlework, 820; preserving, 160; baking, 200; woodwork, 94; health, 280; home, 401; dramatic performance, 141; arts, 103; public speaking, 24; club meetings, 12; soil erosion, 28; tree-planting, 320; eradication of weeds, 430; while 8,072 took part in group projects such as land service, collecting bones, beautifying school grounds, combating soil erosion, etc. In addition, 20 teams were trained for judging and 54 for demonstration purposes; 26 achievement days were held and successful camps, attended by 1,207 members and leaders, were held at Lydenburg, Lichtenburg, Pretoria, Vaal-Hartz, Frankfort, Heilbron, Stellenbosch and Rooigrond. Special club shows were again held at Lydenburg, Bothaville and Johannesburg.

Land Service.

As a result of the outstanding success of the agricultural club movement among children, a national land service movement for adolescents (over 18 years of age) came to be established and already promises to grow into one of the most important and beneficent movements for promoting the general welfare of the country.

Unfortunately, no full-time officer, who could give continuous attention to this work, was available during the past year. Nevertheless, interest in the movement has been growing steadily and several successful land service camps have been held in all the Provinces. These were well attended and valuable work was done in the way of combating soil erosion, planting trees, building reservoirs, assisting farmers with the harvesting of crops, and so forth. This movement was launched during the war, but will have an opportunity of proving its importance and national value in the near future.

Co-operative Demonstrations.

During the past year extension officers again devoted considerable attention to co-operative demonstrations on private farms as an important part of their propaganda for better farming. These demonstrations, based on the principle that "seeing is believing", are proving outstandingly successful, mainly because the results are obtained on ordinary farms rather than on experiment stations.

But apart from the propaganda value of co-operative demonstrations, the information gained therefrom is proving extremely helpful to the Department. A particular crop or farming practice which has proved itself under the environment of a particular experiment station can, through the medium of co-operative demonstrations, be tried out in other areas. Even negative results in this respect are of value, as they prevent wrong advice and propaganda from being disseminated.

During 1945-46 approximately 400 co-operative demonstrations were conducted by extension officers in various parts of the Union and very useful information was obtained. The reports submitted by extension officers indicate that attention was again focussed mainly on stimulating the production of fodder crops in rotation with cash crops.

Where possible, the crops should be either legumes or perennials, in order to improve the nitrogenous content and the structure of the soil. Insufficient supplies of high quality reserve feeds for stock and insufficient attention to suitable systems of rotation for maintaining the fertility of cultivated lands, are considered to be two of the main weak links in our systems of farming. It is for this reason that co-operative demonstrations are focused mainly on these two aspects.

The reports indicate that good results were obtained with vetches, dryland lucerne, setaria grass, Rhodes grass, clovers and the improved varieties of teff. Vetches, mainly hairy types, have again done well in the south-eastern Orange Free State, north-eastern Cape Province, eastern Transvaal and parts of Natal. This crop is proving to be particularly well suited to the two first-mentioned areas, owing to the shortness of the summer season and the slightly higher rainfall during the six winter months as compared with the recognized summer-rainfall cropping areas. If planted early in autumn, hairy vetches will provide good grazing in winter and spring, and will in addition yield a good crop of hay with the aid of spring rains. Attempts at seed production have been fairly successful, especially under irrigation in the Lydenburg area, and it is hoped that very soon sufficient seed of this valuable crop will be produced in the Union to meet the growing demand.

Mainly as the result of the stimulus provided by the existing Government subsidy, an increase in the area under dryland lucerne is reported and good results have been obtained.

Co-operative demonstrations with Setaria grass in various areas of high rainfall have proved very successful. This grass yields a large quantity of highly nutritious feed and is becoming popular. Being a perennial, it is a useful crop in rotation with annuals.

In co-operation with the Agricultural Research Institute, Pretoria, which kindly supplied the seed, a number of co-operative demonstrations were again laid down in the eastern Transvaal highveld with the improved strains of teff that were bred by that institution. The results again proved that some of the strains are eminently suited to the highveld, the yields obtained being in some cases three times as great as those obtained from the commercial variety. Good progress has been made with seed production.

Whole-Farm Demonstrations or Demonstration Farms.

From a small beginning during the 1942-43 season, when 6 farms were selected and started as whole-farm demonstrations, this method of publicity for better farming systems and conservation farming has now been extended to 20 different areas. Of the 14 new farms, 7 completed their first season, while 7 were started during the year under review and will be in full swing in the coming season.

Whereas in the case of the ordinary co-operative demonstration only one or a few aspects of better farming are demonstrated, in the case of whole-farm demonstrations the whole farm is taken over for the purpose of demonstrating a suitable system of farming for the area in which the farm lies—naturally with the consent and full co-operation of the owner. The farm is carefully chosen in respect of size and various other factors. A committee consisting of the farmer co-operator, the local extension officer and as many other Departmental officials as are required for the various branches of farming represented on the farm, decides on the system of farming to be followed and works out all details on the farm management programme. This the co-operator must undertake to adhere to for at least a period of some years; as a *quid pro quo*, the Division

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assists him by meeting such additional or "unusual" expenditure as may be called for under the new farming plan.

The results obtained with whole-farm demonstrations have been very promising indeed. They have proved conclusively that *conservation farming pays*. Six farms, which have now completed their fourth season, have again given much higher yields and at the same time more stable returns to the farmers concerned than ever before. In addition, improvement in the quality and cover of the veld and in the fertility of the lands is clearly noticeable. Many of the farms



Waste not, want not. — Turn waste material into compost.

were, apart from other reasons, chosen because they were on the decline as far as fertility was concerned. Any improvement in this respect must therefore be attributed to the improved system of farming and the improved methods of land use that are being followed.

From the experience so far gained it is clear that the two main essentials of a sound system of conservation farming, namely, the ensuring of a satisfactory financial return and the improvement of the fertility and productivity of the soil and veld, can readily be attained. The main factors taken into consideration when determining the most suitable system of farming to be followed are, naturally, the ecological conditions pertaining on the particular farm or, in other words, "farming with and not against Nature". Notwithstanding this fact, however, experience has taught that the systems are flexible enough to permit of some variation in order to fit the system into the economy of the country. An example is the interchangeability of poultry and pigs in many cases. This flexibility also makes it possible to allow the farmer to follow his own preference in certain instances; for example, as regards particular breeds of livestock to be kept.

As the name indicates, these whole-farm demonstrations, perhaps more appropriately termed "demonstration farms", aim at demonstrating under actual farming conditions the most suitable systems of farming for the areas concerned, as well as sound methods and

practices of land use within the approved systems. Their success must therefore be judged in the first instance by the influence they exercise on farming in the surrounding areas. Although the development of demonstration farms is still in its infancy, it is already clear that they are proving a great stimulus for better farming.

In the course of last year short articles on the objects and results of some of the demonstration farms were published in *Farming in South Africa*, and the agricultural and daily press also gave some publicity to the results obtained. Furthermore, very successful farmers' days were held at two of the demonstration farms and were attended by approximately 700 farmers in all.



The dairy cow fits into the farming system on the highveld.

The effect of this publicity has been remarkable. The Division as such, and particularly the extension officers in the field, have lately received a flood of requests from farmers either to plan suitable systems of farming for their farms, or to make use of the latter for demonstration purposes. This keen interest shown by farmers in improved systems and practices of farming is very encouraging. Since whole-farm demonstrations appear to be a highly effective medium for passing on information at the disposal of the Department in a practical manner to farmers, it is the intention of the Division to extend the system as rapidly as the staff position allows.

A special word of appreciation is due to the co-operators who are conducting whole-farm demonstrations on their farms. They are rendering invaluable, unselfish service not only to the Department, but to the whole farming community of the Union. The Division also wishes to acknowledge the invaluable assistance rendered by other divisions and departments, notably by the Department of Forestry, the Division of Agricultural Education and Research and the Division of Chemical Services.

Film Services.

The cinema has established itself securely as one of the most popular forms of entertainment and it is also rapidly developing into a highly important medium of instruction and education.

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Many years ago, in the early days of the extension service in South Africa, good use was made of the films which were then available. Cumbersome apparatus had to be transported by train from Pretoria to the towns where extension officers were stationed. From there these officers had to travel by car, over rough roads, to the most remote parts of the country—to show films where the cinema was almost unknown. Nevertheless, these films were enthusiastically received and certainly helped enormously to spread knowledge of better farming methods. The depression hampered the further development of these pioneer film services. At the time of the Empire Exhibition and prior to World War II a few more South African agricultural films were produced, but the progress made left much to be desired, due mainly to lack of the necessary equipment, staff and suitable up-to-date films to expand this service.

The former Division of Soil and Veld Conservation made excellent use of films in an effort to waken the country to the dangers of soil erosion. An officer of that Division was deputed to make films for this purpose and to show them to rural and urban audiences throughout South Africa. This he did with outstanding success: his original film "South Africa in Danger" became known throughout the length and breadth of the country and was always in great demand.

Since the formation of the new Division of Soil Conservation and Extension, steps have been taken to improve and expand this important branch of the service. It is planned to have in each of the five regions established under this Division one cine van fitted with the most modern cine equipment procurable. Staff will be trained in the art of cine-projection and photography. It is felt that the time is now ripe for the production of films which give positive advice and guidance on conservation farming, and every effort is to be made to have good sound films produced in colour for this purpose.

Radio.

The radio, a relatively new device in the field of agricultural education, has increased greatly in importance as an extension medium since the war. Restrictions on travel and increased demands on the time of both extension personnel and farmers have also been influential in bringing about the change. This has been the case all over the world.

The radio has been used in South Africa for some time to disseminate advice on farming and domestic science. Until April 1946, short programmes were put on the air three times a week. With the co-operation of the South African Broadcasting Corporation, the programmes have been lengthened and are now broadcast at a more suitable time. Instead of the ordinary "straight" talks, the programmes now include interviews, forums, discussions and actualities. To obtain the necessary material for these programmes, the organizer of the radio services of this Division accompanied members of the Broadcasting Corporation on an extended tour in a mobile recording van. On this tour of over 2,000 miles, recordings were made at the Vlekpoort and Drakensberg Conservation Areas, the agricultural colleges at Glen, Grootfontein, Cedara and Potchefstroom, on various farms, as also at the Döhne Experiment Station and on sugar plantations in Natal.

The present service is to be further improved in the near future, when 20-minute programmes will be on the air on Mondays and Wednesdays, at 8 p.m. It is the intention to make the fullest use of all sources of information. The Division desires the co-operation of all those interested in better farming and soil conservation. The

programmes will most certainly not be limited to the voice of the Government expert—the voice of the farmer, of the manufacturer, or of the consumer, will be heard in future programmes.

The type of programme which covers an informal discussion by a team of four or five men, representing various trades, interests or ideas, all having a real interest in the subject under discussion, has proved most satisfactory and popular. Listeners prefer listening to an interview rather than to a straight talk, and actually or outside broadcasts help to stimulate local interest and enhance the value of the programme.

With the help and co-operation of the South African Broadcasting Corporation, future programmes should be interesting and entertaining enough to ensure that agriculturists in all parts of the Union, not to mention townspeople, will listen in regularly, and it is hoped they will find the programmes instructive in regard to the vital issues of increasing the country's agricultural output and conserving our natural resources.

(2) Animal Husbandry.

It goes without saying that extension officers have to develop a broad and balanced outlook on farming in their areas which enables them to advise farmers not only in regard to correct systems of farming, but also as regards the relative emphasis to be placed on any particular branch. Soil conservation is primarily a matter of correct and balanced farming; very often the significance of the part played by livestock in a farming system is not sufficiently understood by the farmer, and this again is not conducive to correct land use.

The officers mentioned are called upon to devote a considerable proportion of their time to advice on the breeding, feeding and management of all classes of livestock. It is interesting to note that 80 per cent. of all the co-operative demonstrations so far conducted have been in connection with the provision of feed for livestock; this is due to general realization of the fact that improved breeding cannot attain the object aimed at unless accompanied by better feeding.

An aspect consistently stressed by extension officers in regard to the improvement of output, is the need for improved autumn feeding conditions in order to lengthen the period of peak summer production of milk, wool, meat and the like. Many of the demonstrations carried out have shown that it is possible to maintain and prolong the summer peak production in a practical way.

Cattle.

As regards cattle, the average production of milk per cow and of beef per steer is still deplorably low in South Africa. There is room for great improvement in these respects. In any farming venture in which cattle play a part, the correct balance between soil, feed (including veld) and livestock must be maintained. Cattle improvement must go hand in hand with soil conservation, correct veld management and better feeding.

The Livestock and Meat Industries Act of 1934 had as its obvious purpose the improvement of cattle, especially by breeding. The duties of bull inspection are carried out by officers of this Division. It is a pleasing fact that the general quality of bulls offered during the year under review showed an improvement on that of pre-war years. In 1938 about 50 per cent. of the bulls offered for inspection

were rejected, and inspectors passed more than three times as many grade bulls as registered bulls. The figures for the past year are:—

BULLS PASSED.		BULLS REJECTED.	
<i>Registered.</i>	<i>Grade.</i>	<i>Registered.</i>	<i>Grade.</i>
3,448	5,485	375	6,028

From these figures it is evident that fewer poor quality bulls are now offered for inspection and that the ratio of registered to grade bulls passed has greatly increased in favour of registered animals. In due course the minimum standard required for passing a bull will probably have to be raised, for there have been complaints by stud breeders that the standard is still much too low.

During the past year this Act was amended and certain improvements introduced. At present there are 172 districts proclaimed as Cattle Improvement Areas. Of these, 84 are in the Cape Province, 36 in the Transvaal, 35 in the Orange Free State and 17 in Natal.

If it is borne in mind that there were on an average only 30 extension officers in charge of bull inspection over the whole of the Union, i.e. about five and two-thirds proclaimed districts per inspector, and that bull inspection is only one of very many duties which extension officers have to perform, then the difficulties under which these officers work is apparent. Farmers who become extremely annoyed because their bulls are not inspected speedily enough, might bear these facts in mind.

Pig Production.

There has been a steady improvement in the type and quality of pigs bred in South Africa. The baconer types are most popular and relatively pure-bred boars are being used to an increasing extent for pure breeding or cross-breeding. Unfortunately the development and improvement of the pig industry have been hampered by the shortage of maize and certain protein feeds.

Horses.

The revival of interests in equine production during the last decade has been fully maintained during the war period. The increasing use of utility types was further stimulated by the uncertain supplies of mechanized power and fuel.

Prices for utility animals reached unprecedented levels and even now the demand far exceeds supplies. Numerous stud animals of the utility breeds have been imported since shipping facilities became available, but tens of thousands of mules and horses were exported during the war.

The Government is keeping step with this renewed interest and has strengthened its studs by fresh importations, while the horse improvement scheme is giving good results. Extension officers throughout the Union are aware of the intensified use of equines and have assisted farmers with advice and guidance in this respect. Shortage of suitable equipment and implements, however, is restricting a wider use of good equines; but interest is growing, so much so, that an embargo has been placed on the export of certain utility types that are in short supply.

Indigenous Breeding Material.

It is felt in many quarters that insufficient attention has been paid in the past to the country's indigenous breeding material. In this connection a suggestion emanating from one of the extension officers has resulted in the formation of an inter-departmental committee to investigate and make recommendations on the protection and development of such indigenous breeding material, notably indigenous "breeds" of cattle, goats, sheep and horses.

(3) Field Husbandry.

Maize Propaganda Campaign.

As a result of extremely unfavourable climatic conditions, as well as a shortage of fertilizers and other factors arising directly or indirectly from the war situation, the Union's maize-crop during the past few years has fallen considerably short of the requirements of the country. A stage was reached where it became necessary to cut the maize rations for animal as well as human consumption, and the prospects for the future seemed anything but promising. In an attempt to improve this situation, it was decided in August 1945 to start an intensive maize-growing propaganda campaign in the maize-producing areas, and this Division was delegated to carry out the campaign.

All extension officers in the areas concerned, totalling 29 districts, were given instructions to devote all their time to this work, and seven additional officers were temporarily seconded from other areas for the same purpose. The Controller of Fertilizers co-operated whole-heartedly in this campaign and made available some 20,000 tons of fertilizer, which was divided amongst the districts concerned. Intensive propaganda was made in the press, on the radio and at numerous meetings called by the field officers. These officers deserve much credit for their success in a big task where time was the determining factor. Within about two months they addressed 68 meetings, which were attended by 4,263 farmers; and they visited 1,532 farms and advised 5,540 farmers individually on the production of maize. Allocations of fertilizer were made to individual farmers by fertilizer committees established in each district. Co-operative societies throughout the area very kindly consented to handle the orders for fertilizer and a short time after orders were placed farmers were beginning to receive their quotas.

Matters began to grow serious, however, when it appeared that all these efforts were likely to be in vain, because the expected spring and summer rains did not materialize and the country found itself in the grip of one of the worst droughts ever experienced. The already over-burdened veld remained almost lifeless, draught animals lost condition, and in many districts the lands remained so hard that farmers found it impossible to plough. With the danger of a serious food shortage looming ahead, the Government then decided as an emergency measure to make tractors available for ploughing purposes in the drought-stricken areas, as described in the following section.

Tractor Scheme.

The Division was placed in charge of this scheme also, which was applied in the eastern Cape Province, the Natal midlands and the major portion of the Transvaal. The Department had only a limited number of tractors available, but with the assistance of the provincial administrations of Natal and Transvaal, it was possible to put some 90 tractors in the field.

The extension officers serving the areas indicated, had to manage the scheme in the field. They were, however, ably assisted by the district committees, already referred to, over which the local magistrates presided. Applications from farmers for assistance in connection with ploughing, planting, discing and harrowing were considered by these committees, and the allocation of tractors was based on the number of applications received from the different areas.

The scheme was received very favourably by the farming community, but, due to the limited number of tractors that could be made available, only a small percentage of what most applicants

required in the way of ploughing, planting, discing or harrowing, could be granted. In some districts the work was retarded by the continuation of the drought and in many instances tractors had to follow up small showers of rain in order to remain usefully occupied. The season was well advanced when the first good general rains came (in January) and these helped to speed up the work.

In view of the threatened food shortage, and in the hope that the frost, in this most extraordinary season, would be delayed, the work of ploughing and planting was carried on until well into March. In Natal, where the drought was at its worst, some 2,650 morgen were ploughed and 135 morgen disced. In the Transvaal, some 5,500 morgen were ploughed, 2,700 morgen disced, 1,138 morgen planted and 230 morgen harrowed. Figures for the eastern Cape Province are not available. In the Orange Free State a separate ploughing scheme was carried out by the Provincial Administration.

Since it was evident that a total crop failure would bring a calamitous food shortage in its wake, all officers concerned with the scheme carried out their various tasks to the outmost of their ability. Fortunately, the frost came very late, and not only was a reasonably good potato crop harvested, but the estimated maize crop of over 18,000,000 bags, in perhaps the worst season this country has ever experienced, reflects well on the efforts of both the farmers and the officials concerned.

Seed Potato Scheme.

In 1941 there were only three seed potato growers' associations, which produced approximately 3,000 bags of certified seed per annum. To-day there are 48 associations organized into 8 regional federations, with a central co-ordinating organization. These associations produced 75,000 bags of A and B certified seed potatoes during the past season.

The important duties of inspection of the crops on the lands and of the seed for certification have been carried out by the extension officers of this Division in collaboration with agronomists of the Division of Agricultural Education and Research.

(4) Home Economics.

The extension services rendered by this section of the Division afford a valuable medium by means of which rural and urban communities can be reached, either collectively or in individual homes, and enlightened on various aspects of home economics.

In spite of the difficult times, organizations of housewives have continued to show a keen interest in these services, which cover an extremely wide range. During the year under review, numerous lectures and demonstrations were given on various home economics subjects including food selection and preparation; preserving of fruits and vegetables; clothing construction, renovation and pattern-making; interior decoration and furnishing; millinery; and general household management. Special attention was given to current food shortages, the provision of suitable substitutes, and the better and more economical utilization of food generally. Radio talks on this subject are broadcast weekly and are proving to be most popular.

Officers of this section visited 524 different centres, giving 572 demonstrations and lectures, and held 10 short courses, the combined attendance amounting to a total of 16,069 people. In addition, they judged at 40 shows; acted as adjudicators in 143 special competitions; visited 49 schools for the purpose of starting girls' clubs; lectured at 18 farmers' days; attended 4 Women's Agricultural Union congresses and 24 other Agricultural Union conferences; wrote 6,017

letters of information to the public; compiled 7 articles for *Farming in South Africa* and 15 for the press service; assisted in organizing health campaigns in the Orange Free State and Transvaal; and gave 52 demonstrations on balanced diets and food selection and preparation.

Experimental cookery tests were carried out with different meals on the market, such as soya, cassava and buckwheat, and recipes were compiled and distributed.

The programme of the home economics officer includes everything connected with home life, the raising of standards of nutrition and the improvement of living conditions generally in the home. In order to become familiar with the various problems which confront the homemaker, these officers spend a great deal of their time during demonstration tours in visiting families in rural areas. At the same time they bring up-to-date and valuable information right into the homes of many farm women who would otherwise be unable to obtain such information.

Due to the current shortages of both personnel and transport, tours of this nature could be arranged only in a few areas during the past year. Altogether 629 homes were, however, visited. The demand for services of this nature is very great, and maximum results in the field of home economics can be achieved only if and when the personnel is strengthened sufficiently to permit of smaller areas being assigned to individual officers; this will enable them to extend their services to every home in the community.

Apart from the wide range of general activities of this section, attention must also be drawn to the following more specific activities:

Work on Settlements.

A great deal has been done through the untiring efforts of the two officers at present responsible for this phase of the work and much success has been achieved. The greatest problem of all is the fact that nutrition standards on settlements are deplorably low; the officers find it extremely difficult to render the required assistance owing to the lack of supplies of fresh or dried fruit, as well as of vegetables and milk.

Most of the work in connection with cookery demonstrations and talks on nutrition is done in the homes. The fact that kitchens are usually too small to accommodate more than three or four women in addition to the demonstrator, makes this work very difficult. Steps should be taken to ensure that officers are supplied with the necessary equipment and suitable accommodation for demonstrations. Unfortunately, facilities regarding office and other necessary accommodation on settlements are extremely poor, and in some instances there are none at all.

The "Werkklasse" organized on settlements have proved to be an excellent medium for teaching clothing construction and the making of useful articles for the home. As in the case of cookery demonstrations, the officers are faced with the problem of finding suitable accommodation and other facilities required for conducting these classes. The small grant made available for this work was again used to great advantage for purchasing suitable material which was supplied to women who attended the needlework classes. On completion, all articles were judged by the officer conducting the classes. It is very encouraging to note that there is a marked improvement in the standard of this work on settlements.

Home visiting is a very important part of the work on settlements, and although home economics officers experience unco-operative and even hostile attitudes in some homes at first, they eventually

succeed in most cases in working their way into the family homes. In all 693 homes were visited and 103 demonstrations given during the past year.

Spinning and Weaving, and Preparation of Wool and Skins.—The one officer in charge of this work was unable to deal with all the applications received during the past year, because there was a long waiting list of applications carried forward from the previous year. She managed, however, to conduct 14 courses in spinning and weaving and two courses in wool and skins, with a total attendance of 192.

Agricultural Clubwork for Girls.

All home economics officers devoted what time they could spare from their other duties to clubwork for girls, but that time was definitely not sufficient. The chief aims in this work are to develop in the clubmates self-directive thinking and a responsible attitude, and also to train them to be capable of completing their tasks unsupervised. During the year 77 clubs were visited and lectures and demonstrations given at each, while six camps were attended.

Agricultural clubwork proved to be an excellent medium for promoting interest in home economics and building a sound foundation knowledge of nutrition and clothing. In many instances clubmates have proved to be the inspiration in the betterment of their homes.



High milk yields are obtained on irrigated established pastures.

Safeguarding the Union's Livestock Industry.

**P. J. du Toit, B.A., Dr. Phil., Dr. Med. Vet., D.Sc., Director,
Division of Veterinary Services.**

A.—Research at Onderstepoort.

Issue of Laboratory Products.

THE following table shows the number of doses of vaccines and other laboratory products issued during the year ended 30 June 1946, as well as the number of tests carried out and smears examined. Comparative totals for two successive years are given. In practically all cases there has been a drop in issues of the various products, which to a great extent is accounted for by the severe drought experienced during the year under consideration. The considerable decline in the issue of horse-sickness vaccine is also accounted for by the fact that less vaccine was issued to the Middle East than during the previous year. The annual block inoculation against anthrax in the Transkei was not carried out during the period under review and this accounts for the considerable decrease in the issue of this vaccine.

	1/7/44 to 30/6/45.	1/7/45 to 30/6/46.	Increase.	Decrease.
Black quarter.....	1,383,315	1,182,855		200,460
Blue-tongue.....	2,303,736	1,649,892		653,844
Anthrax.....	5,948,980	5,144,690		804,290
Contagious abortion.....	79,988	88,942	8,954	
Gallsickness.....	181,506	76,135		105,371
Tuberculin.....	33,864	39,214	5,350	
Mallein.....	4,269	5,175	906	
Paratyphoid.....	324,260	253,119		71,141
Fowl typhoid.....	559,385	506,412		52,973
Horse-sickness.....	369,190	202,841		166,349
Fowl-pox.....	797,950	1,004,950	207,000	
Nodular Worm Remedy.....	19,490,100	15,388,200		4,101,900
Tetram..... (gal.)	5,200	2,922		2,278
Bloodpens.....	128,820	135,835	7,015	
Blow-fly..... (gal.)	45,089	39,901		5,188
CCl ₄ (gal.)	3,765	615		3,149
Lamsiekte.....	—	157,255		
<i>Serum Tests.</i>				
C.A. Tests.....	19,637	13,593		6,044
Dourine.....	5,089	5,213	124	
<i>Smears.</i>				
Onderstepoort.....	98,441	104,119	5,678	
Pietermaritzburg.....	54,297	55,298	1,001	
Grahamstown.....	4,112	8,672	4,660	
Umtata.....	182,000	224,085	42,085	
East London.....	59,793	98,564	38,771	
Natal.....	340,360	343,621	3,261	
Kokstad.....	—	34,293	—	

Protozoal Diseases.

Nagana.

During the year under review the nagana position in Zululand deteriorated markedly as a result of the spread of *Glossina pallidipes* through the low-lying and heavily bushed country throughout the

potential fly area. This was mainly due to favourable climatic conditions for the fly, the unprecedented breeding which took place and the increase of the bush thickets favouring the dispersion of the fly along the bush leaders and rivers. The disease spread to extreme limits in all adjoining native reserves, on to the Ntambanana, Nkwaleni, Entonjaneni, Hluhluwe and Mkuzi settlements and on to the Magut area in the Ngotshe district, affecting all the farms north of the Nongoma-Magut road, extending across the Pongola river into Swaziland. The total area affected is approximately 4,000 square miles. The mortality amongst cattle from trypanosomiasis was high and heavy losses were suffered by all cattle owners in the areas involved.

All control measures against the tsetse fly were intensified during the year, in close co-operation with the Department of Native Affairs. These consisted of game eradication, bush clearing, controlled burning, D.D.T. applications and trapping.

The game eradication campaign in the Umfolozi Game Reserve and adjoining Crown lands was well organized. The eradication of game in the native reserves is under the direct control of the Department of Native Affairs.

Bush clearing consisted mainly of barrier and thicket clearings. In the Mkuzi and Umfolozi Game Reserves the thicket clearings are directed against the breeding areas of *G. pallidipes*. The thicket clearings in the Mkuzi Game Reserve were suspended when D.D.T.-spraying by aircraft was commenced in November 1945. In the Umfolozi Game Reserve approximately 2,500 acres of thickets were cleared. Barrier clearings, 24 miles long and $\frac{3}{4}$ mile wide, have been completed along selected watersheds in the Crown lands south and west of the Umfolozi Game Reserve in an attempt to stop the southward spread of the fly, and so protect the Ntambanana Settlement and native reserves. In the Hluhluwe Game Reserve a barrier clearing 4 miles long and $\frac{1}{2}$ mile wide has been completed along the eastern boundary of the game reserve across the Hluhluwe river. All clearings were done by native labour, but arrangements were made for the Division of Soil and Veld Conservation to take over all bush-clearing operations. These clearings are to be increased to a width of $1\frac{1}{2}$ to 2 miles, especially across bush leaders and rivers. All bush clearings in the native reserves were undertaken by the Department of Native Affairs.

When trapping started in the Umfolozi Game Reserve in 1931, burning of grass was discontinued to preserve the traps. This resulted in a marked encroachment of bush and heavy thickets. During the past three years annual grass fires were organized in the late dry season to burn out the bush thickets. The results are very encouraging and extensive bushed areas have been opened up where the grass is again establishing itself.

D.D.T. is a very useful weapon against *G. pallidipes* which is most susceptible to the lethal effects of the preparation and it therefore only remains for correct methods of application to be evolved. The first application of D.D.T. in a furnace oil solution by aircraft gave promising results but was not entirely satisfactory. In the meantime observations are being continued in an attempt to determine the most effective way of applying the insecticide.

Trapping with the Harris trap revealed that although it was the best mechanical means of recording the presence of *G. pallidipes*, it can no longer be considered an effective control measure for the eradication of this species. The Harris trap will, however, still be used for extensive surveys within the potential fly areas and will

also be used to indicate the seasonal variations of fly densities within the high fly-density areas in the game reserves.

In addition to the above control measures, the gazetted cattle-free areas were also maintained. This was necessary to prevent cattle providing the food supply to hungry flies in the areas in which game were being eradicated and also in adjoining areas. Steps are also to be taken to prevent the white rhino from wandering out of their sanctuary in the western portion of the Umfolozi Game Reserve into native reserves and the Ntambanana Settlement.

Anaplasmosis.

As the result of the outbreak of lumpy skin disease amongst the cattle of Onderstepoort during April 1945, the issue of gallsickness vaccine was temporarily suspended. Since no further cases developed after the beginning of July 1945, tests were undertaken to determine whether recovered animals remained reservoirs of the virus for any length of time. Vaccine was therefore re-issued from the middle of October 1945, but during March 1946 a fresh outbreak occurred and the issue of gallsickness vaccine was stopped immediately.

At present gallsickness vaccine is being issued from the Veterinary Research Laboratory, Pietermaritzburg, only. Unfortunately the stabling accommodation is very limited at that station, so that only a small number of reservoirs can be maintained there for the production of gallsickness vaccine. The demand for the vaccine is very great and consequently only a comparatively small number of doses of vaccine can be supplied to farmers. The epizootology and other aspects of lumpy skin disease are not fully known and it is therefore impossible to state when the vaccine will again be issued from Onderstepoort.

Virus Diseases.

Horse-sickness.—The vaccine contained the same strains of virus as in the previous three years. The number of doses issued showed a decrease over the previous year due mainly to the smaller demand from the Middle East. A total of 202,841 doses was issued as follows: South Africa, 94,101; Military (South Africa), 4,693; Syria, 250; Palestine, 28,150; Egypt, 59,100; Belgian Congo, 147; Trans-jordan, 4,900; Middle East Forces, 10,000; and French Liaison, Cairo, 1,500.

Work on the attenuation and antigenic analysis of additional strains of virus continued. As a result the vaccine to be issued for the 1946-47 season has been modified by the substitution of two new strains to give a wider polyvalent immunity.

Further investigations into the propagation of virus strains in fertile hens' eggs were carried out and a comprehensive survey of the value of the guinea pig in identifying different strains of virus is nearing completion.

Blue-tongue.—A wide variety of problems connected with the propagation of virus strains in fertile hens' eggs were investigated with the main object of replacing the present vaccine with a safer and more efficient vaccine. About 40,000 doses of bivalent vaccine produced entirely from eggs were issued for field purposes on an experimental basis. Good results were obtained and it has been shown that the whole of the vaccine requirements can be produced entirely from eggs if accommodation, equipment and the necessary staff be made available. Meanwhile a method has been worked out for producing a polyvalent vaccine from sheep, using egg attenuated strains for the

purpose. This vaccine will go into general production for the 1946-47 season.

Further progress was made with the identification of strains of virus from different parts of the Union and altogether 21 strains have now been isolated.

Of the old vaccine 1,609,892 doses were issued, a considerable decrease on the number issued during the previous two years.

Lumpy Skin Disease.—It has been shown that the blood is infective before the typical skin lesions make their appearance. The vector has not been identified, nor has it been possible to commence any research into the development of any method of immunization. The results of a small preliminary investigation into the degree and duration of immunity have indicated that after 12 months the immunity, in some cases at least, may not be complete.

Heartwater.—Further examination has shown that although different strains of virus differ markedly as regards virulence, all appear to have the same antigenic structure. Immunization of adult cattle has been extended and confirms the opinion that the method is practical, but its extension to general use continues to be dependent upon the discovery of some method of cultivation. Work on chemotherapy with various sulphonamides has continued with promising results.

Rabies.—Only diagnostic work was carried out, and of the 62 cases examined, 11 reacted positively, whilst in 5 cases no diagnosis could be made.

The difficulty of diagnosing rabies in dogs in South Africa purely by histological methods must again be stressed.

Fowl-pox Vaccine.—The old method of producing this vaccine from pigeons has been abandoned and replaced by an egg culture vaccine, using the American fowl strain and also a pigeon strain. All the vaccine will now be made at Onderstepoort.

Physical and Physico-chemical Work.—Some progress was made with this work which, however, has had to be curtailed on account of the absence on study leave in America of the officer conducting the work. The chief work carried out was in connection with the production of lamsiekte vaccine.

Bacteriology.

Anthrax.—The vaccine made from avirulent strains of the organism continues to give good results under field conditions. Experiments are in progress to ascertain whether the medium for the cultivation of the organism can be improved to produce a more efficient hyperimmune serum.

Blackquarter.—Attempts are being made to decrease the dose and at the same time maintain the efficacy of the vaccine.

Bloedpens.—There was a slight decline in the demand for the vaccine, but this is to be expected as in most flocks immunization has been carried on for some years and only a single annual dose is given instead of the two given the first year.

Contagious Abortion.—Inoculation against this disease is being undertaken on an ever-increasing scale. It is realized that, except under special circumstances, the isolation policy is unsatisfactory as a means of dealing with the disease. Although calftubercle vaccination is particularly recommended, a large number of heifers and cows are being inoculated. It is difficult to judge the results, but from correspondence with farmers it would appear that they are very satisfactory. Fresh cultures of strain 19 used in the vaccine production are

imported from the United States of America at regular intervals in order to keep the efficacy of the vaccine as high as possible. Experimental work on the improvement of the media for vaccine production is in constant progress.

Tuberculosis.—Although the tuberculin issued at present is still the heat-concentrated product which has given such good results for some years, experimental work is in progress on the production of a purified protein derivative (PPD) tuberculin such as is in use at present in Great Britain. There should be no difficulty in preparing this type of tuberculin for use in a general tuberculosis campaign when this is undertaken. During the past two years a number of cases of tuberculosis in dogs have been diagnosed, mainly in Johannesburg. These are mainly human in type, but one bovine type has been diagnosed. Experiments on the immunization of cattle with the Vole bacillus are being continued, but the results on the whole have been rather disappointing.

Paratyphoid.—A number of fresh strains of different types of paratyphoid organisms have been diagnosed. An outbreak of abortion in mares at a remount camp at Pinetown has been investigated and associated with *Salmonella abortus equi* infection which was also responsible for joint infections in a number of animals.

Lamsiekte.—The production of the vaccine against lamsiekte is being studied very carefully. At present the vaccine is still being produced in a medium made from horse flesh and gives a satisfactory immunity, but the dose is rather large (10 c.c.), and research is being directed towards decreasing the dose, while at the same time increasing the efficacy of the vaccine. With the present method of giving two inoculations with an interval of six weeks, it is felt that in some cases the immunity developed may not be quite high enough to resist large doses of virulent toxin. It may become necessary to give a third inoculation but, if the efficacy can be improved, this can be avoided. The decrease in dose and the addition of alum to the vaccine to cause it to be more slowly absorbed will probably make two or even one dose efficacious.

As a result of information received from the United States of America that corn steeping liquor, a by-product in the commercial production of starch, was a very valuable substance for addition to media for the production of botulinus toxin, it was tried here and found to give a very much better toxin than meat media. At present a biochemist is collaborating with the officer in charge of lamsiekte research in the study of the properties of corn steeping liquor, and valuable results are being obtained. Fortunately this material is easily obtainable from a starch factory at Germiston near Johannesburg. It has not been possible yet to produce all the vaccine required on account of a shortage of large culture flasks, but these should soon be available.

Routine Diagnosis.—A large number of blood samples for the diagnosis of contagious abortion and dourine have been examined. A big variety of specimens for bacteriological diagnosis have been sent in for examination, most of which were examined in the various departments of the section.

Poultry.—The shortage of staff has continued and the numbers of specimens and letters received from farmers have shown no falling off. For these reasons, and also on account of the fact that much time has had to be devoted to the training of veterinary students, the amount of research work conducted has had to be limited severely.

Some progress has, however, been made. For the first time, it has been proved that there is a familial predisposition in fowls to the development of brain cancer. This is of considerable scientific interest, even though the cancers are so rarely seen that they are of no economic importance.

Progress has been maintained in building up a strain of White Leghorns not only comparatively resistant to all forms of cancer, but also highly desirable in all other respects.

During the year a new fowl-pox vaccine was perfected and it is now on sale to the public. Further evidence has been obtained of the widespread incidence of psittacosis in pigeons and the risks to pigeon fanciers should always be remembered.

There has been little, if any, abatement in the spread of Bacillary White Diarrhoea. With the old established and more reputable breeders supporting the B.W.D. test on an ever-increasing scale, the present spread of the infection seems to be due mainly to the large number of small farmers who have within the past few years taken to the breeding of poultry. Until some satisfactory scheme for the registration of poultry breeders can be evolved, little further progress in the control of B.W.D. must be expected. Finally, mention must be made of the complete eradication of Newcastle Disease from Natal, after it had been in existence for about a year. Unfortunately this devastating disease now exists all along the East Coast and has spread right across Central Africa to the Atlantic, so that further outbreaks must be expected.

Allerton Laboratory.

Vaccines.—Details of the number of doses of vaccine and other products issued from this laboratory during the year are included in the figures in the schedule contained earlier in the report

Smears.—In order to obtain assistants for the examination of smears, the Institution trained 19 smear examiners from the ranks of stock inspectors and assistant stock inspectors. The number of smears examined during the period 1 July 1945 to 30 June 1946 was 55,305, as compared with 56,001 for the previous year.

Serological Tests.

Contagious Abortion.—During the period under review a total of 2,856 tests for contagious abortion was carried out as against 3,742 for the preceding year.

B.W.D. Tests.—A very large number of tests are carried out every year, but the year under review was characterized by an increase in applications from the Cape, especially the western Cape Province. Most of the farmers concerned run flocks of 1,000 to 8,000 birds and from the tests carried out it appears that B.W.D. and/or Fowl Typhoid is generally prevalent in those areas. The present number of holders of the B.W.D.-free certificate is 129 as compared with 101 last year. They are divided up among the various provinces as follows:—

Natal	42
Transvaal	52
Orange Free State ...	15
Cape	20
Total	129

In addition the following number of flocks of active poultrymen are under test in the various provinces:—

Cape	16
Natal	7
O.F.S.	13
Transvaal	20
Total	56

The tests undertaken this year numbered 323,749 with 4,432 positives, as compared with 260,343 tests and 5,443 positives last year.

Post Mortems.—A large number of poultry post mortems were carried out, viz. 664 compared with 889 in the previous year.

Other post mortems carried out were mainly on pigs and calves and most cases showed paratyphoid and worm infestations.

Visits by farmers.—A total number of 528 farmers visited the Laboratory during the year.

General Laboratory Work.—Smear-control work from the districts of Natal increased greatly during the year and a certain amount of mastitis work was also carried out. A few cows were treated with Penicillin, but it was not possible to draw conclusions. A large number of specimens received from farmers was dealt with, whilst many slides were brought in by farmers for urgent diagnosis. In addition, a number of fowls were tested for export purposes and for entry in the Rhodesian Egg-laying Competition.

Parasitology.

Entomological Research.

(1) An extensive investigation into the sheep blowfly problem was undertaken under field conditions in the Graaff Reinet area during the period June 1945 to May 1946. This comprised studies on the species of blowflies in the area, together with their bionomics, both on the living sheep and in carcasses, in correlation with climate. Valuable additional evidence was obtained in respect of the rôle played by the large blue-bottle fly, *Chrysomya marginalis*.

(2) An investigation into the value of D.D.T. under field conditions for the protection of sheep against blowfly strike was undertaken in the Graaff Reinet and surrounding districts and practical methods of application, together with the question of costs, were studied. The protection afforded averaged three months.

(3) The details for the execution of the tsetse fly eradication campaign in Zululand were elaborated at Onderstepoort and the application from aircraft conducted in the Mkuzi Reserve. This entailed the making and testing of spray solutions and, later, methods for the application of D.D.T. in aerosol or smoke form, both from aircraft and static smoke generators.

(4) Investigations regarding the effectiveness and application of D.D.T. for the control of external parasites of domestic animals were actively pursued throughout the period.

(5) Further investigations into the transmission of horse-sickness and blue-tongue were conducted chiefly in respect of the toxonomy and life histories of the various species of *Culicoides* involved.

(6) The Union tick survey was continued throughout the year together with the life history studies on ticks.

(7) Laboratory studies on the effects of the synthetic insecticides, D.D.T. and hexachlorobenzene, incorporated in dips, upon blue ticks

of the arsenic resistant strain were carried out in collaboration with the chemistry section of Onderstepoort.

(8) A short series of toxicity tests of D.D.T. upon cattle was undertaken at the request of the Division of Entomology. The results indicated that pastures could be treated with D.D.T. at rates calculated to destroy insect pests without fear of producing toxic symptoms in cattle, or in man as a result of consuming milk from such cattle.

(9) Numerous inquiries in respect of the control of external parasites of animals were dealt with in correspondence. A great deal of interest on the part of the farming community was displayed in the new synthetic insecticides.

(10) The usual routine examination of specimens of external parasites submitted was conducted, together with the examination and testing, in a few instances, of proprietary insecticides forwarded with the view to their registration prior to being placed on the market.

Helminthology.

Until the middle of December 1945 all the activities of this section had to be carried out by one professional officer, assisted by a part-time technical assistant with the result that most of the work in the section consisted of routine work. An opportunity occurred, however, to carry out an investigation of a severe outbreak of helminthiasis in sheep in the Garies district of Namaqualand. The trouble was diagnosed as due to severe infections of wireworms, brown stomach worms and bankrupt worms superimposed on an infection of large-mouthed worms. The pathogenesis of this last-mentioned worm is not clear, and material and infected sheep were brought to Onderstepoort, where a study of the morphology of the parasite, its life history and effects on sheep is being carried out.

Investigations on the lungworm of dogs are also being continued, but so far it has not been possible to clear up the life history of this parasite, and all attempts to set up an artificial infection have failed.

Large-scale experiments are being carried out at Onderstepoort with phenothiazine to ascertain its efficacy against wireworm and nodular worms in heavily infested sheep. The effects of tetrachloroethylene treatment, and of good food with no treatment are at the same time being followed on two groups of similarly infected sheep.

Bio-Chemistry.

Progress has been made with the study of the nutritive value of South African feeds. The analyses in connection with the digestion trials with grass species from Rietondale Experimental Farm have been completed. Investigations on the chemical composition, with special reference to the sugar, starch, hemicellulose, cellulose, and lignin contents of certain grass species growing under natural conditions and of the oat plant grown under irrigation during winter at various stages of growth, have been initiated. A study relating to the influence of processing and storage on the biological value of the proteins in balanced stock rations is under way.

The availability for rats of the calcium and phosphorus in "electrophos", a product supplied by a private firm, has been investigated. Results were disappointing in that the availability was found to be on the low side in comparison with that of a well-known product like dicalcium phosphate. The investigation is being extended to include ruminants.

Work on the iron and copper metabolism of sheep has been continued. A daily supplement of 500 mg. copper per sheep had no apparent influence on the general health and appetite of the sheep.

During the latter half of the year under review the full-time services of a chemist have been made available to the Bacteriology section. A medium of alkalinized and filtered corn steeping liquor supplemented with calcium lactate has been developed and found to be very much superior to the meat broth hitherto used for the production of toxin by the type D botulinus organism.

Work on the identification of the active principles in the poisonous algae responsible for water poisoning is being continued. Preliminary work on the isolation of the poisonous principles in various plants, including *Urgenia rubella*, *Urgenia burkei*, *Solanum panduraeforme* and *Hertia pallens*, is in hand or has been completed. Some attention is also being devoted to Geeldikkop from the point of view of a possible interaction of the nitrate in the Tribulus plant, reduced in the rumen to nitrous acid, with chlorophyll or its degradation products.

Routine analysis again took up a fair amount of time. These included the analysis of animal feeds, salt and water samples on behalf of the farming community, blood and vegetation samples in connection with Armoedsvlakte experiments, and a variety of other routine determinations, e.g. of copper, iron, and vitamin A in post mortem material and fluorine in water samples.

Nutrition.

The uncertainty of securing feedstuff supplies has been a drawback in the carrying out of basic nutritional research on large animals over long periods. In addition, members of the staff have been occupied in the distribution control of protein-rich feeds and bone meal.

Work is continuing, however, on osteodystrophia fibrosa in equines, on which some progress may be reported. Attention is also being given to the digestibility co-efficients of various indigenous grasses and trees. The determination of the suitability and digestibility of different forms of phosphate will be undertaken. The influence of different rations on the softness of bacon is also receiving attention.

Assistance and advice have been granted to farmers and others. Correspondence with farmers in regard to their feeding problems during the present shortage of essential feeds has increased considerably.

Physiology.

Research Work.

(1) *Digestion of Ruminants*.—Various experiments are still in progress in regard to conditions in the fore-stomachs of sheep and the factors determining the multiplication of bacteria and other organisms in these compartments. Particular emphasis has been laid on the effects of different types of food supplements on the consumption and digestion of poor quality veld hay. Furthermore, attention is being directed to the movements of the fore-stomachs and large colon with the object of elucidating the origin and nature of the so-called "dry gallsickness" and other forms of digestive disturbances in ruminants. Various physiological drugs are being tried out in order to restore normal motility. In a further experiment observations are being made in regard to digestion in worm-infested sheep and the influence of feeding on the degree of parasitism.

A sound-colour film of 1,000 feet (made in collaboration with the Film Bureau, Union Education Department, Pretoria) regarding the nutrition of ruminants from the physiological aspect has been completed in the course of this year. This film has already been

shown on various occasions and has been well received. The production of further films will be undertaken in due course, should conditions permit.

(2) *Bioclimatological work on sheep*.—This long-term experiment extending over more than three years has been practically completed and is to be concluded within the near future. Valuable results of a comparative nature have been obtained from sheep continuously exposed to the sun as against others kept in the shade throughout the same period.

(3) *Sex physiology of sheep. The influence of hormone therapy on ewes during anoestrus*.—Interesting results have been obtained on limited numbers of sheep at Onderstepoort. It would indeed be worthwhile to extend these experiments to large numbers of animals kept under natural veld conditions with accurately controlled nutritional levels. Hormone supplies have also been sent out to veterinarians in the course of the year for testing out especially on cows where sterility is encountered. The results of such tests are to be co-ordinated as soon as the majority of the reports have been received.

Faculty Work.—Lectures in physiology with practical work and demonstrations are being continued to second-year B.V.Sc. students, while classes in practical clinical physiology are arranged for third-year B.V. Sc. students.

Pharmacology and Toxicology.

The head of the section resigned from the service in the course of the year, the result being that very little research work could be carried out.

Up to the end of April this section was responsible for both the mineral and botanical routine specimens sent in for analysis and advice.

(1) Altogether 3,042 routine specimens of entrails of animals, water, suspected poisonous plants, soil, licks etc., were analysed. Apart from the chemical analyses, a large number of biological experiments were carried out in connection with suspected poisonous plants and samples of concentrates.

(2) The poisonous-plant garden was in a very bad state and some time was spent there in order to improve the garden. The identification of the plants was not altogether satisfactory as a number of labels were missing and a large number of plants had died. An attempt is being made to identify all plants, to separate them into different beds and to label them properly. The fences have been improved in order to prevent trespassing. For various reasons a large number of plants had died off and an endeavour is being made to replace these, as well as to add new specimens to the collection.

(3) Experiments are being conducted with the object of determining the possible arsenical content of the bones of sheep after continuous dosing with nodular worm remedy and wire-worm remedy.

(4) As a large number of complaints is received in connection with various concentrates, the possibility of fungus poisoning is being investigated. *Fusarium moniliforme* is the first fungus to receive attention.

Surgery, Gynaecology, Sex-Physiology and Radiology, Etc.

Clinic.

Total number of animals treated	2,615
Total number of radiographs	123
Total number of cases treated by diathesing	13
Total number of cases treated by ultra-violet rays	7

Total number of clinical cases treated	1,173
Total number of inoculations	553
Total number of tests	889
Total number of natives treated in First Aid Clinic	284

Research.

Observation on Roaring and Whistling in Horses.—Observations on the heredity of "roaring" in horses have been continued, and 290 horses have now been examined, of which 140 were the progeny of "roaring" sires. There were 8 "whistlers" in the suspect group and five in the control group. There has been no significant difference in the incidence of recurrent laryngeal paralysis between the two groups. In these observations it has not been possible to keep a careful record of the veterinary history of all the cases prior to examination for their wind, that is, at about the age of 3 years and 9 months. It is, however, apparent that an attack of strangles predisposes a horse to laryngeal paralysis. As yet there is no indication that "roaring" is hereditary. A preliminary report is in course of preparation but, before the observations can be completed, the results of mating "roaring" stallions with mares, the progeny of "roarers", must necessarily be studied. This will take about 5 years to complete as available mares for this mating are only coming forward now.

Sex Physiology.

(1) Work on the sex-physiology of mares kept under the environment prevailing, under housed conditions, at Onderstepoort has been continued and is now reaching finality. The report will be ready for publication at an early date.

The observations so far recorded indicate that oestrus in the mare may continue throughout the year, but there are indications that mares do not conceive easily during the winter months. The data assembled on this point have not yet been fully analysed.

(2) The work on the sex physiology of cattle maintained under conditions of lack of sunlight, lack of exercise, and dry rations has been completed and the final report is now in the press.

(3) The observations made on cattle, in which delayed breeding was superimposed on the above environment, have also been completed, including work on this microscopic picture of the ductless glands and the genitalia.

(4) The work on the sex physiology of rams, that is, the study of the sperm picture in relation to their fertility, has been written up and is now in the press.

Mastitis.

During the past year the data relating to the secretion of abnormal milk by quarters which were free from pathogenic bacteria, were analysed. The records were obtained from regular monthly analyses of milk from the individual quarters of the mastitis-free herd during the previous five years. The results are given in the accompanying table.

An investigation into the various factors which may be responsible for the high percentage of abnormal samples of milk secreted by healthy cows kept under coverage during farming conditions, was carried out. This revealed that a combination of factors was concerned, the most significant revelation being the marked effect of seasonal influences. Contrary to the findings of workers in Europe

SAFEGUARDING THE UNION'S LIVESTOCK INDUSTRY.

Results of Regular Monthly Analyses of Milk from Individual quarters of Mastitis-free Cows.

Constituents.	Total Number of observations made.	Number of times milk was—		Percentage abnormal.
		Normal.	Abnormal.	
Solids-not-fat.....	1,476	866	610	41.3
Fat.....	1,476	1,431	45	3.0
Chloride.....	1,388	9,533	435	31.3
Lactose.....	1,256	903	353	28.1
Chloride-Lactose Index.....	1,255	761	496	39.5
Cells.....	1,168	837	331	28.3

and America where the quality of milk is at its best during the winter months, there was a significant deterioration in milk quality during the South African winter, the milk being abnormal from May until August.

It was concluded that the low plane of nutrition on which the average dairy cow in South Africa was maintained for the greater part of the year, was mainly responsible for this deterioration. The best quality milk was obtained during spring and early summer (October and November) when the natural vegetation of South African pastures has its highest nutritional value.

In collaboration with the Allerton staff, tests were carried out at Cedara to ascertain the efficacy of the intravenous administration of acriflavine in the treatment of mastitis. In no case was the udder freed of mastitis streptococci by the intravenous administrations of acriflavine or gonacrine.

At the same time 8 cows were subjected to penicillin treatment. The results were so encouraging that the whole herd will now be treated with penicillin. This should provide useful information on the value of this drug in the treatment of mastitis.

Horse Improvement Scheme at Ermelo.

The horse improvement scheme at Ermelo has been continued, and it is very popular with farmers. The service is of great value to the horse-breeding industry.

Kaalplaas and Onderstepoort Farms.

The work at Kaalplaas and Onderstepoort farms continues to be most satisfactory. The beef herd continues to make satisfactory improvement, and type uniformity is rapidly being attained. It has supplied cattle for all research purposes, and also meat for native rations, supplemented from Armoedsvlakte.

The calves born at Kaalplaas are used for various types of research: paratyphoid, heartwater and gallsickness, tuberculosis, contagious abortion and lumpy skin disease. It would be difficult to estimate the value of Kaalplaas to the Institute, both scientifically and economically.

The mares used for breeding are being used for observations on equine abortion, as well as to provide draught horses for use on the farms.

The breeding policy adopted with cattle is the crossing of Afrikaner bulls and Sussex-native cows. The $\frac{1}{2}$ -cross has been reached and the cattle have proved highly suitable for our conditions.

No winter concentrate feeding is given. Bonemeal and salt (2-1) are constantly accessible through self-feeding "hoppers". In spite of the dry winter conditions the cattle maintain good condition.

The Zulu herd continues to do well. Good progress has been made in achieving type uniformity.

The cattle, as they have developed, are considered an excellent type, being small and hardy. They are most resistant to our local diseases and to tick infestation.

The possibility of maintaining an infected herd and a herd free from contagious abortion on the same farm has been proved. The Zulu herd is infected and the other herd has remained free.

Small-Animal Section.

The breeding of small animals continues most satisfactorily. The demands of the various sections producing vaccine, etc., have all been met. This was made possible by the extended facilities provided last year. The following issues were made from this section :—

White mice	127,800
White rats	549
Rabbits	228
Guinea pigs	6,781
Ferrets	38

Attempts are constantly being made to improve our methods of management and breeding, and also to breed other species of small animals suitable for laboratory research.

Chemical Pathology.

Research.

(1) Large scale experiments are in progress in the coastal belt of the East London area with the new insecticides D.D.T. and benzene hexa-chloride (gammexane) against all external parasites of stock.

A large number of dipping tanks (about 30) have been filled with various strengths and formulations of these substances and regular dipping is being carried out under control. Dipping analyses are carried out both at the tanks and in the laboratory. Both substances have been found to be effective against the arsenic resistant blue tick. Questions in regard to the stability of both the emulsions employed and that of the substances themselves have as yet not been elucidated.

In the same series of experiments certain other dip formulas, e.g. that of Trollope and S. C. v. Rooyen, were also investigated. Both, however, proved to be of no value in combating the arsenic resistant blue tick.

All the work in connection with the manufacture of the vast amount of dip concentrates used in these dipping tests was undertaken by this section.

(2) Due to the staff shortage, only a portion of the important chemical and physical investigation of the dips could be undertaken. The investigation regarding a suitable field tester has hardly as yet received proper attention.

(3) In conjunction with other sections the following analytical work was undertaken :—

(a) Copper experiment (Pathology): determination of sugar, non-protein nitrogen: phenol and bile pigments in blood.

(b) Bio-climatological experiment (Physiology): same determination as before.

(c) Urea urine determinations (Physiology).

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Pathology and Anatomy.

(a) Specimens submitted for pathological examination :—

Species.	Outside.	Onderstepoort.	Total.
Bovine.....	500	65	565
Ovine.....	62	100	162
Equine.....	57	29	86
Porcine.....	97	9	106
Canine.....	106	45	151
Feline.....	14	—	14
Avian.....	24	15	39
Caprine.....	5	—	5
Piscine.....	7	—	7
Game (various species).....	39	1	40
Small lab. animals.....	—	73	73
Human.....	6	—	6
Unspecified.....	4	—	4
TOTAL....	921	337	1,258

(b) Post mortems :—

Species.	Outside.	Onderstepoort.	Total.
Bovine....	38	59	97
Ovine....	20	390	410
Equine....	—	37	37
Porcine.....	33	7	40
Canine....	111	—	111
Caprine....	—	17	17
Baboon.....	1	—	1
Jackal....	—	1	1
TOTAL...	203	511	714

(c) Sections prepared for microscopic examination :—

Paraffin-embedded sections.....	9,454
Frozen sections.....	5,020
Paraffin-embedded sections (for students).....	1,006
Frozen sections (for students).....	37
Paraffin-embedded sections (for students histology).....	857
Frozen sections (for students histology).....	233
	16,607

A large number of conditions of interest were encountered among the routine specimens received in the course of the year.

Research into the following conditions were continued or undertaken :—

- " Lamkruis ", a demyelinating disease of lambs in certain coastal areas.
- Posterior paralysis in various domestic animals, with special reference to bovines.
- Affections of the nasal cavities in bovines, particularly in relation to carcinoma.
- Toxoplasmosis in dogs.
- Sterility in bovines, with special reference to the physiology and pathology of the genitalia and endocrine organs.

- (f) Certain aspects of the pathology of lumpy skin disease and globidiosis.
- (g) Various skin conditions in relation to the differential diagnosis of lumpy skin disease, e.g. onchocerciasis, demodectic mange, mycotic dermatitis and superficial necrosis of unknown aetiology.
- (h) The pathology of canine piroplasmosis and nephritis.
- (i) The spindlecell-like epidermoid carcinoma of the skin of rats following continued exposure to sunlight (completed).
- (j) The pathological anatomy, histology and cytology of the endocrine and reproductive systems of aged, late-bred sheep was undertaken as part of fertility experimental procedure in the Department of Surgery.
- (k) The problem of vulvar cancer in Ayrshire cows was investigated in Natal, and observation is now being carried out on animals held under experimental control at Onderstepoort. Special attention is being given to the rôle played by sunlight.

Medicine and Therapeutics.

Rickettsiosis of dogs.—During the year an outbreak of this disease in the Pretoria district was investigated. The outbreak was diagnosed primarily in the south-western portion of Pretoria North. Later, further cases were detected in the Bon Accord-Pyramid area and Soutpan road north of Onderstepoort. The distribution consequently is fairly extensive and the future will undoubtedly reveal that many other parts of the Transvaal are infected. This is a disease which may seriously interfere with the dog population. The investigation work undertaken was mainly in connection with the improvements of methods of diagnosis, pathological anatomical changes, artificial transmission and chemo-therapy. Research in connection with the clinical, pathological and haematological changes in *Babesiosis* of dogs, and to a certain extent of bovines, continues.

Medical clinic for in- and out-patients.

Disease.	Animals Treated.	
	Small Animals.	Large Animals.
(1) Disease of digestive system.....	75	13
(2) Respiratory system.....	17	4
(3) Urinary system.....	12	—
(4) Nervous system.....	12	—
(5) Circulatory system.....	5	—
(6) Diseases of metabolism.....	4	1
(7) Protozoan diseases.....	164	11
(8) Rickettsia diseases.....	18	10
(9) Virus diseases.....	15	9
(10) Metazoan diseases.....	97	12
(11) Mycotic diseases.....	12	—
(12) Bacterial diseases.....	5	4
(13) Skin diseases.....	54	—
(14) Miscellaneous.....	43	20
TOTAL.....	533	84

Zootechnics.

During the year under review the staff position at Armoedsvlakte deteriorated further, and the changes adversely affected the station's work.

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Experiment Work.—The “Pica Test”, which was conducted over 4½ years, and aimed at elucidating the nature of osteophagia and allotriophagy in general, was concluded. The data await analysis and publication. The “Lick Test” in which cattle, free to take their phosphate supplement out of troughs, are compared with cattle which receive their supplement *per os*, was continued and amplified by the “Bonemeal *versus* Salt Equilibrium Test” which aims at determining whether it is possible to control the intake of a phosphatic supplement by adding salt. The indications so far are encouraging.

The main bionomic researches upon the four herds of grade cattle are being continued, but under the prevailing staff conditions the data collected cannot be written up.

Because the Meat Research Institute at Onderstepoort had no staff, the usual annual slaughter tests on steers bred at Armoedsvlakte could not take place and the steers were sold as surplus cattle.

Lumpy skin disease broke out on both Armoedsvlakte and Biesjesvlakte and close on 50 cattle were affected. Three pure-bred bulls became sterile as a result of the infection.

The high-grade Afrikaner and Sussex bull calves, which were retained as grade bulls, at the request of the Division of Agricultural Education and Research, were sold by public auction as 2-year-olds. The Afrikanders sold very well, in fact better than the pure-bred Red Poll bulls. The Sussex, however, sold very poorly. There was practically no demand for them.

Meat Research.

The Meat Research Institute undertook no research work in abattoir or cold storage technique during the year.

During the year the Meat Laboratories slaughtered 149 cattle, 70 equines and 396 sheep, all for routine purposes.

Wool Research.

During the war a considerable volume of research, particularly on the fundamental properties of the fibre and on the by-products of wool, was conducted overseas. With the cessation of hostilities there is every indication that research on all aspects of wool will be intensified to a degree never before attained, and it is essential that South Africa should not lag behind other wool-producing countries in this respect.

During the past year wool research at Onderstepoort was continued along the lines indicated in previous reports, but the progress of the work was considerably retarded by the acute shortage of staff during the year. An improvement in the position is expected, and as a result an expansion of the work is envisaged.

The Yield of Wool.

The major part of the investigation has been concluded with the completion of approximately 1,200 tests on clips in collaboration with the British Wool Commission. It has been concluded that sample testing by the methods developed is reliable, for the error in yield is estimated to be smaller than 1 per cent. in 80 cases in a 100, and to exceed 2 per cent. in only one case in a 100.

The Yield Investigation Sub-Committee has submitted a final report to the Congress of the National Wool Grower's Association, and a new Sub-committee has been appointed to proceed with the matter. The laboratory has estimated the cost of a testing house capable of testing 30 lots per day, and the Sub-Committee's recommendation that such a testing house be erected has been referred by

the National Wool Grower's Association Executive to the S.A. Wool Council for further action.

The laboratory's investigations were conducted along the following main lines:—

- (1) The sampling of clips for yield determinations.
- (2) The testing of samples.
- (3) The comparison of the results of sample tests and those of complete scouring and combing tests.

The results were a vindication of the methods developed.

In addition to the main problems, the following points were also investigated:—

- (4) Yield of wool from different areas. Complete analyses of samples from the different wool-growing areas were carried out in order to study the peculiarities of the various types. This investigation is being continued.
- (5) The reliability of human estimates. With the aid of Departmental officers the reliability of human estimates has been further investigated. The results confirm previous findings, viz. that the grease and sand contents of the wool are the main causes of erroneous estimation, and that appraisers tend to overestimate low yields and underestimate high yields. The value of tests as a guide to appraisers was again evident.

Wool Testing Service.

The analysis of fleeces for merino breeders and wool growers was continued. The experience gained during the past twelve years is laying increasing stress on the necessity of employing exact methods of judgment in breeding. The service consequently not only consists of the routine testing of samples and fleeces, but is also developing in the following directions:—

- (1) The development of systems of recording for breeding records.
- (2) Investigation of the reliability of tests on samples instead of on entire fleeces.
- (3) The application of progeny testing to certain studs.
- (4) The establishment of standards, based on accumulated data as regards the standard of production, conformation, and the variation of fleece characteristics.
- (5) A special study of the weaknesses inherent in the practical judgment of the merino and its fleece.
- (6) The development of methods of measuring fleece characteristics on a large scale, as required in breeding studies.

The Bio-climatological Experiment.

The investigation of the influence of climatological factors was continued. The wool-research laboratory is responsible for the fleece analyses, while the collaborating sections of Physiology, Statistics, Solar Radiation, Chemical Pathology and Sex Physiology are studying the meteorological factors and the animal functions.

Previously the sheep had been fed a sufficient ration, but during the past year the ration was reduced in order to study the influence of climatic factors under the adverse conditions usually met with during the winter months and during drought periods. The analysis and correlation of the results are proceeding.

The Influence of Age on the Merino Sheep.

Although this experiment has been completed, the analyses require a considerable number of routine measurements. The main

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characteristics under investigation are conformation, wool production, fleece attributes, dentition and nose-prints.

The results will have an important application in sheep-breeding practice, but will also affect experimental technique. For example, the possibility of errors in the estimation of age by examination of the teeth has been clearly demonstrated, while a density test before the animal is full-grown has been shown to be unreliable.

The Characteristics of South African Merino Wool.

Following the principle that any application to practice is based on a thorough knowledge of the subject, the study of the basic characteristics of South African Merino wool has been continued unabated. The influence of nutrition and breeding is being studied, as also the relationship between the fleece characteristics, for it has been found that the study of any one attribute involves the study of several others.

Characteristics being studied include the following: fibre fineness, length, whiteness, tensile strength, extensibility, durability, surface friction, specific gravity and compressibility. An extension of this aspect of the work is contemplated with a view to including such characteristics as fibre contour and depth of crimp. In addition the part played by various factors in determining quality in wool will be investigated.

The investigation necessarily included the development of suitable methods of measurement and the modification of methods for application to determinations on a large scale. The study has been extended to include histological studies with a view to correlating the wool characteristics with those of the follicle population.

Wool Chemistry Research.

During the war enormous sums of money were spent on research into wool grease, with the result that the uses of wool grease and its secondary products have increased considerably. Approximately 50,000,000 lb. of wool are scoured annually in the Union, and most of the 6,000,000 lb. of wool grease is lost, besides, 1,500 tons of potash salts representing 20 per cent. of our total imports.

Research in this direction has been conducted along the following lines:—

- (1) Wool grease determinations.
- (2) Rapid methods of wool grease analysis at the scouring plant.
- (3) Co-operation with washeries as regards specific problems.
- (4) Tests on wool grease recovery (centrifugal system).
- (5) Purification of wool grease.
- (6) The constituents of wool grease.

Textile Testing.

Testing of textile for Government Departments has been continued. The laboratory has made a valuable contribution to the standardization of textiles, cotton wool, etc., during the past years. An agreement has been reached with the S. A. Bureau of Standards, whereby this body will in future undertake the routine testing of textiles while Onderstepoort will confine itself to the research aspect.

Analyses were carried out for the Stellenbosch-Elsenburg College of Agriculture. Members of the staff paid a fruitful visit to the Wool Research Laboratory at Grootfontein, and the Leather Research Institute at Grahamstown. Officers from Grootfontein paid a return visit to Onderstepoort.

During the past year advice was given to breeders and farmers, and assistance rendered to industrial and commercial undertakings

in regard to technical problems. An active part was taken in the deliberations of wool congresses.

The financial aid provided by the South African Wool Council is gratefully acknowledged.

Statistics.

Statistics as a science can only flourish in an atmosphere of vigorous research.

Continuing the work on the statistical analysis of time series, a new statistical coefficient, the *sequential variance*, has been constructed. This coefficient, summarizing the *form* of a time series, is the basis of a method for comparing two or more time series as a whole, thus eliminating the tedious and ambiguous processes which had to be used up till now. Seen from a biological point of view, this coefficient throws light on the *size and form* problem in morphology.

B.—Field Work.

As is customary, the report surveying the field work of the Division covers the period 1 July 1945 to 30 June 1946.

Lumpy Skin Disease.

The disease made its first appearance towards the end of December 1944 in the Marico district, and at the end of June 1945 the whole district was considered infected. The adjoining districts, viz. Rustenburg, Lichtenburg, Ventersdorp, Klerksdorp, Brits and Pretoria also became infected and with the advent of winter the spread of the disease was retarded, but during the summer months the disease spread further, resulting in the whole Province of Transvaal, the northern portion of Natal, the whole Orange Free State, excluding the southern portion and the northern districts of the Cape Province adjoining the Transvaal and Orange Free State provinces, also becoming infected. The disease also made its appearance in the Paarl district but the source has not yet been determined.

It is definitely a peculiar disease and has not responded to routine methods of investigation. It is believed to be insect-transmitted, and work to establish this in detail is proceeding at Onderstepoort.

The staff was increased to a great extent with a view to carrying out extensive inspections, and in order to control the movements of stock and avoid the spread of the disease, the area was divided into heavily and lightly infected areas and a buffer zone created in the Cape Province.

East Coast Fever.

Natal.—During the year there were no fresh outbreaks of East Coast fever in Natal and the position can be regarded as very satisfactory. Twenty-four farms in the Province became clean by lapse of time. Only three farms in the district of Vryheid remained in quarantine at the end of June.

During the year 520,903 deaths due to various causes occurred out of a cattle population of 2,739,478. The number of smears examined was 415,052, while 91,888 smears could not be examined owing to the acute shortage of staff. The position improved, however, as a result of the appointment of lay assistants at various centres in the Union.

Transvaal.—There were no outbreaks of this disease during the year and the position is satisfactory. Quarantine was raised on one farm which had 43 deaths during the period 8 April to 11 November 1944 and which was cleared by slaughter on 27 and 28 November

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1944. One farm which had one death on 16 March 1945 remained subject to control.

The number of smears examined was 98,065 as compared with 110,198 deaths.

Transkei.—There was one fresh outbreak in an old infected tank area, the Libode district, after 17 months without any deaths. One death occurred in a tank area which has been infected since February 1943.

The number of smears examined was 226,496 as compared with 229,757 deaths.

Eastern Cape Province.—This area remained free from East Coast fever.

The number of smears examined was 102,049, but a large number of deaths was attributed to the unprecedented drought.

Foot and Mouth Disease.

The Union remained free of infection during the period under review and precautionary measures were further relaxed in the eastern Transvaal. Control was, however, still exercised in certain portions of the eastern Transvaal in proximity to the Kruger National Park.

Anthrax.

There was an increase in the number of outbreaks in the various provinces, but the higher figure is partly explained by the intensive propaganda carried out amongst stock owners in areas known to be infected and resulting in a higher proportion of cases being detected.

Regular annual inoculations took place involving over two million head of cattle.

The following table indicates the incidence of the disease :—

Province.	No. of Outbreaks.	No. of Deaths.
Transvaal.....	114	451
Natal.....	70	261
Eastern Cape Province.....	52	125
Transkei.....	20	31
Western Cape Province.....	16	60
Orange Free State.....	52	180
TOTAL.....	324	1,108

Scab.

There were 11 outbreaks as compared with 10 outbreaks last year.

These outbreaks occurred in the following districts :—

District.	Outbreak.	Remarks.
De Aar.....	1	Origin unknown. District free from disease for years.
Hanover.....	1	Contact to outbreak in De Aar district.
Mafeking.....	2	Origin unknown.
Ermelo.....	5	Three attributed to introductions from adjoining territories.
Groblersdal.....	1	District previously infected.
Potgietersrust.....	1	Origin unknown.
TOTAL.....	11	

Goat Mange.

The following outbreaks were reported:—

Cape Province	48
Transkei	3
Transvaal	1
Natal	5
Total	57

The small-stock census produced the following figures:—

Woolled sheep	28,121,222
Non-woolled sheep	6,439,797
Angora goats	564,314
Other goats	5,207,105
Total	40,332,438

Mange in Other Animals.

Cases of mange were discovered in various areas and dealt with. The following outbreaks occurred:—

	Equine Mange.	Bovine Mange.
Cape Province.....	24	10
Natal.....	9	1
Transkei.....	24	8
TOTAL.....	57	19

Tuberculosis.

The number of herds under official test showed a slight decrease, but there is no doubt that if the necessary staff were available, many more breeders would come in:

	Herds.	No. Tested.	No. of Animals Infected.
Natal.....	7	2,454	8
Transvaal.....	14	1,417	91
Transkei.....	1	293	-
Eastern Cape Province.....	37	5,421	2
Western Cape Province.....	34	4,850	15
Orange Free State.....	13	801	2
TOTAL.....	106	15,236	118

One herd in the Pretoria district was tested for the first time with disastrous results. Out of a total of 222 animals, 62 positives and 10 suspicious reactors were encountered.

Nagana.

This disease caused very heavy mortality and spread to areas where it had not occurred for many years.

It is estimated that the nagana position from October 1945 to June 1946 was as follows:—

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Division.	Infected Areas.		Estimated Mortality.
	Native.	European.	
Eshowe.....	20	94	5,500
Nongoma.....	37	83	10,200
Vryheid.....	-	37	6,600
TOTAL.....	57	214	22,300

Discriminate bush clearing was undertaken to prevent dispersion of the fly from high density areas, as well as the destruction of game, the food supply of the fly, in the potential fly area.

D.D.T. dusting was undertaken by means of aeroplanes and smoke generators.

Rabies.

Outbreaks were dealt with as they were discovered.

The following cases were diagnosed either histologically or biologically:—

	No. of Outbreaks.	Species.
Cape Province.....	2	Canine and bovine.
Orange Free State.....	8	1 Canine, 2 bovines, 3 felines and 2 meercats.
Transvaal.....	1	Feline
TOTAL.....	11	

Dourine.

This disease occurred in various parts of the Union and, unfortunately, owing to the lack of staff it was not possible to continue with block tests. The Natal Province remained free from the disease.

Newcastle Disease.

This disease was controlled by restricting the movement of poultry and slaughtering out the last focus of infection at Lamontville, Durban, in January 1946.

There were no further outbreaks

Non-Scheduled Diseases.

Tick-transmitted diseases, redwater, anaplasmosis and heartwater were prevalent and responsible for heavy losses, particularly in areas where regular dipping of cattle is not enforced.

Arsenic-Resistant Blue Tick.

Experiments were carried out with D.D.T. and gammexane and satisfactory results were obtained. Limited supplies of gammexane arrived in the Union recently and it is hoped to be able to make D D.T. available for use in cattle dips at an early date.

Certain South African firms have already included these substances in their proprietary products.

Staff Position.

The position regarding Government veterinary officers remained acute and extreme difficulty was experienced in obtaining candidates to fill vacancies.

During the period under review eight Government veterinary officers resigned from the Service, one was transferred to the Division of Agricultural Education and Research, while it was possible to make only nine new appointments.

Review of Agricultural Production and Prices in the Union from 1939.

S. J. de Swardt, B.A., M.Sc., Chief of the Division of Economics and Markets.

IN surveying the economic aspects of our agricultural industry in the first full year of peace, it will be profitable to draw a comparison not only with the preceding year, but also with the whole war period. The past year can be regarded as the introductory period of the re-adjustment of our agriculture to peace-time conditions and the direction into which our agricultural industry has been guided by the war up to the last year, therefore, serves as the starting-point for the new trend which can be expected from this year.

Agriculture the world over has played an important rôle during the war, and ever-increasing demands have been made on agriculture in the Union to contribute to the maintenance of the civilian population as well as the military forces of the Union and the allied nations.

Price control was introduced during the war years mainly to counteract inflation. The prices of food products had, however, to be raised periodically in order to cover the rising costs of production and cost of living of farmers, and to encourage the latter to increase their production. In spite of this encouragement, however, it became apparent at an early stage during the war that agriculture could not fully meet the rapidly increasing demand, and it was considered essential to regulate, by means of control measures, the consumption of the more important food products. The factors which had an especially limiting effect on agricultural production were:

- (1) unfavourable climatic conditions;
- (2) a shortage of the means of production like fertilizers, tractive power, good seed, etc., and
- (3) a shortage of labour, owing to recruitment to the forces.

Nevertheless, the farmers of the Union largely satisfied the higher demands made on them during the war. The production of all agricultural products in the Union is estimated to have increased by approximately 10 per cent., and the area under cultivation by 14 per cent. since 1939, and this in spite of the impeding factors with which farmers had to cope. Of these factors, unfavourable weather conditions had by far the most important limiting effect on production.

Prices of Agricultural Products.

Table I indicates the average annual price index of the main groups of field crops and animal products as well as the price index for all these groups combined, based on the averages for the three years immediately preceding the war, viz. 1936-37 to 1938-39.

The table reveals that the combined price index for all groups of agricultural products rose steadily during the war from 103 points in 1939-40 to 169 points during the past year.

The general advance in prices is to be attributed mainly to a condition of practically continuous relative shortages of agricultural products to meet the increased demand during the war years as well as the past year, and to cover increased production losses.

REVIEW OF AGRICULTURAL PRODUCTION AND PRICES FROM 1939.

TABLE I.—*Price Index of Agricultural Products (1936-37—1938-39=100).*

Season (1st July to 30th June).	Summer Cereals.	Winter Cereals.	Hay.	Other Field Crops.	Pas- toral Pro- ducts.	Dairy Pro- ducts.	Slaugh- ter Stock.	Poultry and Poultry Products.	Com- bined Index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
Weight :	19	13	2	3	34	6	17	6	100
1938-39	92	107	96	89	79	102	106	92	93
1939-40	86	107	77	95	115	105	106	89	103
1940-41	109	113	106	156	102	108	110	104	108
1941-42	121	134	143	203	102	131	134	145	123
1942-43	160	149	144	159	122	147	167	173	146
1943-44	169	172	137	212	122	154	182	204	157
1944-45	184	183	160	280	122	177	172	187	163
1945-46	203	188	164	314	118	198	176	193	169

(a) Maize and kaffircorn.

(b) Wheat, oats and rye.

(c) Lucerne and teff lay.

(d) Potatoes, sweet potatoes, onions and dried beans.

(e) Wool, mohair, hides and skins.

(f) Butter, cheese, milk and condensing milk.

(g) Cattle, sheep and pigs.

(h) Fowls, turkeys and eggs.

In Table II the price index of agricultural products is compared with the general wholesale price index, as compiled by the Department of Census and Statistics and converted on the basis 1936-37—1938-39=100.

TABLE II.—*Comparison between Price Index of Agricultural Products and Wholesale Price Index (1936-37—1938-39=100).*

Year.	Price Index of Field Crops and Animal Products	Wholesale Price Index.
1938-39.....	93	100
1939-40.....	103	105
1940-41.....	108	116
1941-42.....	123	128
1942-43.....	146	146
1943-44.....	157	153
1944-45.....	163	155
1945-46.....	169	158

From the above table it appears that compared with wholesale prices, the prices of agricultural products were, on the whole, lower until 1942-43, when the two series showed equal rises as compared with prices ruling during the basic period of 1936-37 to 1938-39.

Subsequently, and up to the past year, prices for agricultural products rose slightly more than general wholesale prices.

Considering the general tendency for agricultural prices to rise rapidly and to high levels during war-time and, in addition, the comparatively serious shortage of agricultural products during the war years and up to the present time, the prices of agricultural products could have been expected, without price control, to rise much higher in comparison with general wholesale prices than was actually the case.

Although the combined index of agricultural prices has risen higher since 1943-44 than the general wholesale price index, it does not necessarily follow that farmers were more prosperous than the rest of the population—i.e. the population group dependent on wholesale prices.

On the contrary, if regard is had to the poor crops actually obtained, and their comparatively high cost, it is obvious that it was by no means as prosperous a period for the farming community as is believed in some circles.

The way in which the prices of the most important production requirements have risen from 1939 to 1946 is reflected in Table III below, which gives the price indexes of farming requirements.

TABLE III.—*Indexes of Prices Paid for Farming Requisites.*

Year.	Imple- ments.	Fertili- zers.	Fuel.	Bags.	Feeds.	Fencing Material.	Dips and Sprays.	Building Material.
1939....	105	105·6	94·5	133·4	90·7	110·6	100·0	102·3
1940..	120	132·3	111·1	178·8	93·9	172·1	112·0	123·6
1941...	124	166·4	124·2	174·5	109·9	207·7	115·0	145·7
1942....	123	157·3	139·6	207·0	135·5	229·4	117·0	168·1
1943..	130	170·8	154·4	237·2	152·3	239·0	127·0	179·3
1944...	161	184·1	155·7	309·9	154·7	239·9	134·0	183·6
1945....	159	203·6	153·9	315·5	164·9	224·5	135·5	180·4
1946....	153	201·4	138·4	308·3	165·1	215·0	134·3	175·2

Although the Division possesses no data based on actual investigations throughout the country, there is information indicating that farm labour costs have risen from 50 to 100 per cent. and, in exceptional cases, even more, during the war.

Agricultural conditions during the past year.

During the past year, every branch of agriculture was detrimentally affected by various factors, especially climate. While the winter-rainfall area had abundant rains during the winter of 1945, which damaged the crops, the summer-rainfall area was stricken by a severe drought. When the drought was eventually broken, only at the beginning of 1946, it rained so incessantly in some areas that the crop-producer found proper cultivation of his crops extremely difficult, especially on the heavier soils.

Although an additional 25,000 tons of fertilizer was made available to maize producers during the planting season, it could not be put to full use owing to the drought. Even after the rainy season had commenced, the farmers could not plough their lands in time with worn-out tractors and thin oxen.

• On the whole, crops were put in very late in the season in the summer-rainfall area and if the frost had not been so late at the beginning of the winter of 1946, yields would have been considerably smaller.

As far as the stock industry is concerned, losses were enormous on account of the drought. Sheep farmers in the Cape Province and cattle farmers in the south-eastern districts of the Cape Province and in the Northern Transvaal were exceptionally severely affected. In addition, lumpy-skin disease caused considerable damage among cattle in the Transvaal and the Orange Free State, as did nagana in Natal.

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Wool.

At the beginning of the war, the sale of wool by public auction was discontinued, clips thereafter being disposed of to the British Wool Commission at fixed prices under agreement. Between 1940-41 and 1945-46 the country's entire production was sold in this way.

The 1946-47 clip will be sold by public auction, subject to a reserve price.

The quantities of wool bought annually by the British Wool Commission were as follows:—

Year.	Purchases (grease-wool basis). lb.
1940-41.....	244,290,000
1941-42.....	239,940,000
1942-43.....	226,550,000
1943-44.....	221,073,000
1944-45.....	201,366,000
1945-46.....	209,717,000

Mohair.

As in pre-war years, mohair was sold by public auction during the war.

Table IV indicates the receipts of exportable mohair at Union ports as well as the average export of mohair per pound.

TABLE IV.*—Receipts of Mohair at Union Ports, and Average Export Values.

Year.	Amount	Average Value per lb.
	lb.	s. d.
1940-41.	4,874,000	17 8
1941-42.	4,199,000	15 2
1942-43.	3,570,000	15 1
1943-44.	4,064,000	15 8
1944-45.	3,082,000	21 0
1945-46 (5 months).	2,500,000	17 0

* Union mohair only.

Hides and Skins.

As a result of the war, the export of skins and hides practically came to a standstill. With Government co-operation, however, contracts were obtained for the local manufacture of military footwear (about 3 million pairs per year).

As a result, the local demand for wet-salted hides reached unprecedented heights.

In 1942 these hides, as well as such dry-salted and sun-dried hides as were required by local tanneries, were placed under control, subject to permits issued by the Controller of Leather, and maximum prices.

In 1945 goat skins, coarse and coloureds and gloves were also placed under control and maximum prices fixed. These skins, especially the two former types, are required for the manufacture of light leather, i.e. uppers and linings. Formerly, local tanneries never concentrated on the manufacture of this leather, which was always imported from overseas. The import position, however, gradually deteriorated during the war and consequently the local manufacturing of light leather was resorted to.

The control of glovers was abolished as from the beginning of 1946. The Union's consumption of this type of skin is small and only exports are still subject to permits. Merino skins, cross-bred sheepskins, karakul pelts and Angora skins have never been subjected to control. Controlled skins and hides not used locally could, however, always be exported under permit. After termination of the military contracts in September of this year, it was decided in some cases to release a larger proportion for export under permit, viz. 40 per cent. of the hides, 20 per cent. of the dry-salted hides and two-thirds of the goatskins. In the case of wet-salted hides and coarse and coloureds, however, no exporting will as yet be allowed.

Table V reflects the annual exports of hides and skins from 1939 to 1944.

TABLE V.—*Exports of Hides and Skins.*

Year.	Hides.	Goat Skins.	Sheep Skins.
	(lb.)	(lb.)	(lb.)
1939.....	19,869,635	5,385,341	39,487,702
1940.....	18,011,020	5,077,254	32,596,224
1941.....	23,059,454	5,522,599	34,879,234
1942.....	14,019,071	5,387,109	33,846,906
1943.....	6,767,813	4,003,309	21,592,558
1944.....	4,559,270	2,279,053	25,105,803

Table VI shows the annual average prices paid for hides and skins at the Port Elizabeth auction mart.

TABLE VI.—*Average Annual Prices for Hides and Skins at Port Elizabeth 1938-39—1945-46.*

Year	Hides.		Glovers.	Angora Skins.	Woolled-sheep Skins.		
	Sun-dried, Firsts.	Dry-salted, Firsts.	Sound.	Sound.	Long Wool.	Medium.	Coarse Wool, Sound.
	Per lb. d.	Per lb. d.	per Piece. s. d.	Per lb. d.	Per lb. d.	Per lb. d.	Per lb. d.
1938-39.....	6·0	5·5	2 9	6·06	4 8	4·1	4·6
1939-40. . .	7·8	7 9	3 8	6·4	6·3	5·4	5·9
1940-41. . .	5·8	6·0	2 10	3·6	6·2	4·9	4·1
1941-42. . .	7·2	7·3	4 0	5·4	7·0	5·1	5·9
1942-43.....	7·8	8·2	3 5	6·0	8·1	5·7	5·3
1943-44.....	8·3	9·4	4 8	7·4	7·0	5·5	6·8
1944-45.....	8·5	9·5	5 3	9·0	7·0	5·8	9·4
1945-46.....	8·5	9·5	7 7	10·0	9·6	8·5	11·8

Meat.

Table VII shows the numbers of slaughter stock according to census returns, slaughtered annually during the period 1939 to 1944, at all abattoirs in the Union.

Although considerably larger numbers of slaughter stock of all classes were slaughtered during the war years than in 1939, meat was by no means plentiful in the Union during the war, owing to the increased demand. In the large cities especially, meat was frequently in short supply. Military requirements could not be met

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TABLE VII.—*Stock Slaughtered Annually at Union Abattoirs in:—*

Year.	Sheep, Lambs and Goats.	Cattle.	Calves.	Pigs.
1939.....	3,510,845	643,282	63,098	286,864
1940.....	3,813,493	708,386	66,377	351,502
1941.....	4,375,645	800,572	79,896	441,413
1942.....	4,597,097	857,422	83,702	535,644
1943.....	4,136,436	843,044	84,120	514,725
1944.....	3,474,252	710,683	87,081	533,928
1945.....	Not yet available.			

through the usual channels and already at an early stage in the war the Government decided to buy slaughter stock for this purpose on the open market in the Union as well as in South-West Africa.

In 1942 the meat markets in certain areas in and in the vicinity of the large cities were placed under the control of the Food Control Organization, which was instituted during that year, and retail meat prices fixed. The Organization also supplied meat for military purposes.

The determination of retail prices only did not, however, have the desired effect of also stabilizing the prices of slaughter stock, and consequently a Meat-control Scheme was introduced in the controlled areas in May, 1944. One of the most important features of the Meat Scheme was the fixation of producer's prices for grades and carcass weight in the controlled areas. All slaughter stock marketed in the controlled areas is bought by the Food Controller at the fixed prices.

As will be observed from Table VII, there has on the whole been a decline in the number of stock slaughtered since 1943.

Since most of the stock is, however, slaughtered in the larger areas, where the acute shortage of meat has developed, the numbers slaughtered in the controlled areas are shown in Table VIII.

TABLE VIII.—*Numbers of Stock Slaughtered in Controlled Areas*

Year.	Sheep.	Cattle.	Calves.	Pigs.
1940.....	2,426,393	509,236	57,090	259,763
1941.....	2,899,467	585,862	68,502	326,813
1942.....	3,068,919	638,104	74,855	375,999
1943.....	2,622,329	607,015	75,797	367,478
1944.....	1,967,152	496,622	78,559	372,412
1945.....	1,940,015	575,835	82,042	393,715
1945, Jan.-Aug.....	1,207,926	423,635	52,754	260,676
1946, Jan.-Aug.....	1,104,312	476,314	53,223	211,372

The above figures indicate that, as far as stock slaughtering in the controlled areas are concerned, a general decline set in in 1944. The position improved slightly in 1945, as compared with 1944. During the first eight months of 1946, however, considerably fewer sheep and pigs were slaughtered in controlled areas than during the first eight months of 1945—probably owing to the drought during the summer of 1945-46 and the general shortage of concentrates.

The Union's meat supplies were supplemented to a considerable extent by slaughter stock from adjoining territories. Receipts from these territories reached their maximum in 1943, however, since when the figures have declined, as shown in Table IX.

TABLE IX.—*Slaughtered Stock received from Adjoining Territories.*

Year.	Cattle.	Sheep (from S.W.A.).
1941.....	107,419	121,874
1942.....	123,858	189,417
1943.....	132,092	183,868
1944.....	115,193	135,240
1945.....	102,317	20,764

During the first half of 1946, however, there was a considerable increase in the number of cattle received from adjoining territories in comparison with the figures for the first half of 1945.

Prices to producers showed a steady increase until price control was introduced and brought into operation under the meat scheme.

Cattle prices reached their peak in 1943-44, but prices for sheep and pigs are still showing a steady upward tendency, as will be seen from Table X, which shows producer's prices on the Johannesburg meat market.

TABEL X.—*Meat Prices* to Producers at Johannesburg.*

	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Beef: Average for good, medium and compounds, per 100 lb..	33 1	35 6	43 8	52 5	59 11	56 1	57 1
Mutton: Medium Merino, per lb.....	6.0	6.2	7.6	9.9	10.4	10.3	11.0
Pork: Average for porkers and baconers, per lb.....	5.1	4.6	5.4	7.5	7.4	7.9	8.0

* From 1944-45 onward, the prices are calculated prices allowing for offal, hides and skins.

Owing to the gravity of the shipping position during the war, it was extremely difficult to import meat. Nevertheless, imports of all types of meat increased considerably, as appears from Table XI.

TABLE XI.—*Imports of all Types of Meat.*

	1938.	1939.	1940.	1941.	1942.	1943.	1944.
Import, million pounds	10.1	10.2	11.6	16.9	16.6	11.8	7.0

During the 1944-45 season, 80,000 sheep carcasses were imported from Australia.

Dairy Products.

Despite considerably increased production, dairy products were in comparatively short supply during the war years, owing mainly to an increased demand. Rationing frequently became necessary.

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Table XII reflects the production of creamery butter and cheese in the Union for the period 1939-40 to 1945-46:—

TABLE XII.—*Production of Creamery Butter and Cheese in the Union (1939-40—1945-46). (October-September Season).*

Year.	Butter Production.	Cheese Production.
	lb.	lb.
1939-40..	44,810,000	13,980,000
1940-41..	44,955,000	13,570,000
1941-42..	40,440,000	15,859,000
1942-43..	42,281,000	15,955,000
1943-44..	42,741,000	15,325,000
1944-45..	39,043,000	15,870,000
1945-46..	33,817,000*	14,125,000*

* Provisional figures.

During the past year the production of both butter and cheese was exceptionally low in comparison with that of previous years, largely owing to the drought which ravaged the country towards the end of 1945. As Table XIII indicates, the prices for butter-fat and cheese milk were continually raised during the war to enable producers to cover their steadily increasing production costs.

TABLE XIII.—*Weighted Average Prices (including winter premiums) for Butterfat and Cheese Milk (1939-40—1945-46). November-October Season).*

Year.	Butterfat Prices.	Cheese-milk Prices.
	Per lb. d.	Per Gallon. d.
1939-40..	14.3	5.7
1940-41..	14.6	6.8
1941-42..	18.5	9.1
1942-43..	19.7	9.8
1943-44..	20.5	9.8
1944-45..	23.9	11.0
1945-46..	27.1*	11.9*

* Provisional figures.

Butter and cheese imports and exports for the years 1939 to 1944 are shown in Table XIV.

TABLE XIV.—*Imports and Exports of Butter and Cheese (1939-1944).*

Year.	Imports.		Exports.	
	Butter.	Cheese.	Butter.	Cheese.
	lb.	lb.	lb.	lb.
1939..	25,000	282,000	6,928,000	4,253,000
1940..	1,000	124,000	6,763,000	2,360,000
1941..	249,000	56,000	4,382,000	550,000
1942..	828,000	54,000	1,699,000	578,000
1943..	1,722,000	30,000	1,435,000	536,000
1944..	74,000	79,000	1,121,000	440,000
1945..	Not available.			

Cheese was exported to England up to 1940, and butter up to 1941, after which dates these commodities were exported mainly to African territories.

Poultry and Eggs.

Although no exact figures are available, there are indications that the production of poultry and eggs was expanded during the war years, despite the comparative shortage of poultry feed. During 1944-45, for instance, 14,399,000 dozen eggs were sold by dealers and egg-circles, the figures for the 1945-46 season being 14,428,000 dozen. During the five months, April to August, 1946, 4,602,000 dozen were sold as against 4,423,000 dozen during the same months of 1945. The August sales for 1946 are also considerably higher than those for August, 1945, viz. 1,869,000, as against 1,387,000 dozen. Owing to the meat shortage there was a strong demand for eggs and slaughtered poultry practically throughout the period, and prices of poultry and eggs as a group rose higher than those of any other group of animal products.

In 1942 a purchasing scheme was instituted, whereby the Food Controller became sole buyer at fixed prices of the best grades of *surplus* eggs during the season of plenty and gained sole control of all cold-storage eggs. These cold-storage eggs were again released during the season of scarcity and disposed of at fixed prices.

Since December 1943, maximum prices have also been fixed for all eggs and table poultry in the controlled areas.

These measures have had a stabilizing effect on producers' and consumers' prices.

The egg-purchasing scheme has been in operation every year since its inception, including 1946. The prices paid under the purchasing scheme during 1946 have been fixed as follows:

On 19.7.46: 1s. 9d. for First grade, large, and 1s. 7d. for First grade, medium. On 9.9.46: 1s. 8d. for First grade, large, and 1s. 6d. for First grade medium.

The latter prices were still in force on 31 August, 1946. From 3 September, 1944, to July, 1945, 1,950,922 boxes of eggs containing 30 dozen each were bought under the purchasing scheme, 2,713,366 boxes being bought during the period 4 August, 1945, to 8 June, 1946.

Wheat.

The production of wheat varied considerably from season to season over the period 1938-39 to 1945-46, mainly because of the instability of production in the Transvaal and especially in the Orange Free State. The estimated crop of the Orange Free State, for instance, varied between 2,632,000 bags in 1942-43 and 267,000 bags in 1944-45, that of the Transvaal between 846,000 bags in 1943-44 and 409,000 bags in 1945-46, whereas the crop in the Cape Province varied between 3,005,000 bags in 1938-39 and 2,311,000 bags in 1945-46. With the exception of the 1945-46 crop, when the wheat crop in the western Cape Province was considerably damaged by excessive rains, the nature of the Union's crops during the 8 years under review, poor as well as good, was on the whole dependent on that of the Transvaal and Orange Free State crops.

Table XV shows the wheat-production figures, (according to threshing results, to which a certain percentage has been added for hand-threshed wheat) and prices including extra allowance of wheat during the period 1938-39 to 1945-46.

Since the wheat requirements of the Union in recent years have been estimated at approximately 6 million bags, it is obvious that the Union could not meet its own requirements during the war. The

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TABLE XV.—*Production and Prices of Wheat during the period 1938-39 to 1945-46.*

	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46
Production in thousands of bags (of 200 lb each)....	5,089 s. d.	4,593 s. d.	4,692 s. d.	3,945 s. d.	6,244 s. d.	5,384 s. d.	3,424 s. d.	2,849 s. d.
Prices for Class B, Grade I..	21 0	22 0	23 0	27 3	30 0	35 11	36 0	37 6

available supplies had to be supplemented by imports and, in addition, measures had to be introduced to ensure economical consumption of these supplies. Consequently, the standard loaf was introduced in 1941 and the free baking of white bread prohibited by a regulation which is still in force to-day, and which also imposed restrictions on the manufacture and use of flour. In 1946 the weight of the standard loaf was reduced from 32 to 29 ounces.

As is shown by Table XVI, wheat and flour have been imported every year since 1939.

TABLE XVI.—*Wheat and Flour Imports 1939-1944.*

Year.	Wheat	Flour.
	Tons.	Tons.
1939.....	5,428	499
1940.....	85,108	3,265
1941.....	44,306	11,869
1942.....	128,355	17,921
1943.....	26,550	7,475
1944.....	11,474	8,940
1945.....	Not available.	Not available.
1946.....	"	"

The export of wheat during the period 1939-1944 was minimal. In 1941, 1,030 tons were exported, and during each of the years 1939, 1940 and 1942 only 10 tons.

Although wheat prices were continually increased, bread prices to the consumer were kept at practically the same level by meeting the rise in wheat prices with a subsidy.

Oats.

Table XVII shows the oat yield for the Union as well as the average price for oats during the light-year period :

TABLE XVII.—*Estimated Oat Crops and Weighted Average Prices of Oats during the period 1938-39 to 1945-46.*

	1938-39.	1939-40.	1940-41.	1941-42.	1942 43.	1943-44.	1944-45.	1945-46.
Estimated crop (in thousands of bags of 150 lb each)	1,569	1,249	1,352	1,230	1,366	1,625	2,248	1,946
Average price per bag	s. d. 9 0	s. d. 10 4	s. d. 12 4	s. d. 14 1	s. d. 15 2	s. d. 15 2	s. d. 15 2	s. d. 12 3

As in the case of wheat, the production of oats in the western Cape Province was considerably less uncertain than in the Transvaal or the Orange Free State. On the whole, the table reflects a gradual increase in the production of oats up to 1944-45. The crop for 1945-46 was poorer than that of the previous year, owing to unfavourable climatic conditions—excessive rains in the western Cape Province and drought in the northern provinces.

Prices increased from 1939-40, till they were fixed at 15s. 2d. per bag (average for all grades of fodder oats) in November 1942. In November 1945 the fixed price was decreased to an average of 12s. 3d. per bag for all grades.

Barley.

On the whole the production of barley also increased over the eight years, as is shown in Table XVIII.

TABLE XVIII.—*Estimated Production and Average Prices of Barley during the period 1938-39 to 1945-46.*

	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.
Estimated crop (in thousands of bags of 150 lb each)....	498	461	529	610	526	640	809	603
Average price per bag (Malt barley, Gr. I, Class A)....	s. d. 16 0	s. d. 16 0	s. d. 17 0	s. d. 17 0	s. d. 18 6	s. d. 21 0	s. d. 21 0	s. d. 21 0

About 90 per cent. of the Union's barley is produced in the Cape Province, and although production in the Transvaal more than doubled itself over the period, the increase in the total crop is attributable largely to the expansion of barley production in the Cape Province.

The prices shown in the table are for six-row malt barley, class A, grade I, and reflect the rise in prices over the period. The prices of other classes and grades were fixed relative to those for class A, grade I, malt barley. From November 1942, barley was placed under control together with rye and oats, and prices were fixed. The Wheat Control Board exercised control and was the sole buyer of barley.

Rye.

Contrary to the case of oats and barley, there was, on the whole, only a slight increase in the total production of rye in the Union during the period under review, as appears from Table XIX.

TABLE XIX.—*Estimated Production and Average Price of Rye during the period 1938-39 to 1945-46.*

	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.
Estimated crop (in thousands of bags of 200 lb. each)....	236	221	201	187	225	258	291	234
Average price per bag.....	s. d. 12 7	s. d. 15 1	s. d. 18 0	s. d. 29 6	s. d. 22 8	s. d. 22 8	s. d. 22 8	s. d. 24 2

The Cape Province produces more than 90 per cent. of the Union's Rye, the Transvaal and Natal very little.

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Although there was a annual decrease in the crop up to 1941-42, prices rose steadily up to that year, but fell in 1942-43, mainly as a result of the introduction of price control in November 1942, when prices were fixed at 23s. 6d. per bag for grade I, and 23s. and 21s. 6d. for grades II and III, respectively, which meant an average price of 22s. 8d. per bag for all grades. In November 1945, the price was increased by an average of 1s. 6d. per bag.

Maize.—Except during two seasons, the Union's maize crop has been below normal every season since 1939-40, due mainly to unfavourable climatic conditions and a shortage of the means of production, like fertilizers, etc.

Maize prices have been fixed since 1941-42 and during that season the prices to farmers were 15s. per bag for the best grades. Subsequently annual increases were granted to compensate farmers for higher costs of production and the rising cost of living, and in order to encourage production.

Table XX shows the estimated maize crops for the seasons 1938-39 to 1945-46, as well as the weighted average price to producers for the best grades (two's and sixes) of maize for the seasons 1938-39 to 1940-41 and, thereafter, the fixed price for the best grade at which the crop was marketed in the corresponding season.

TABLE XX.—*Production and Prices of Maize 1938-39—1945-46.*

Year.	Estimated Production.	Price per Bag.
	Bags.	s. d.
1938-39	29,020,000	8 1
1939-40.	20,701,000	10 1
1940-41.	24,323,000	11 0
1941-42	16,341,000	15 0
1942-43	24,336,000	16 0
1943-44.	18,371,000	17 6
1944-45.	18,387,000	19 0
1945-46	18,131,000	22 6

The annual consumption of maize in the Union is estimated to have risen to the neighbourhood of 22 million bags during the war, with the result that the crop was not sufficient from year to year. Owing to the comparative shortage of maize, steps were taken at an early stage in the war for the conservation and economical consumption of the Union's limited available supplies. In addition to other measures, the export of maize and maize products was restricted, and local consumption has been regulated by a permit system since 1942 in order to ensure that maize is used primarily for human consumption and the production of important protective foods. The regulation of maize consumption has been steadily maintained up to the present, and has, if anything, been enforced even more rigidly as available supplies dwindled. Owing to the critical nature of the shipping position during the war, it was practically impossible to supplement the supply with imports.

In 1942 the Maize Control Board was authorized to become the sole buyer of maize in grain elevators and later in the same year also took over all maize stocks from co-operative societies. Since 1943, the Maize Control Board has been sole buyer of all maize, and agents

have been appointed to do the purchasing on behalf of the Board. The Board, therefore, also obtained physical control over maize and was thus enabled to ensure equitable distribution.

In Table XXI the export of maize and mealie meal is shown in thousands of tons for the years 1939 to 1944.

(later figures were not available):

TABLE XXI.—*Export of Maize and Mealie meal (1939-1944).*

Year.	Maize.	Mealie meal.
	Tons.	Tons.
1939.....	704,000	177,200
1940.....	465,600	80,000
1941.....	185,000	27,600
1942.....	22,600	3,800
1943.....	700	4,400
1944.....	4,500	6,400

The past season's crop, which is estimated at slightly more than 18 million bags, was very seriously affected by the severe drought during the latter half of 1945. In most areas, farmers could do no ploughing and planting until very late in the season, and although additional 25,000 tons of fertilizer were allocated to certain districts, the drought prevented farmers from making full use of it. Fortunately frost was exceptionally late at the beginning of the winter of 1946, as a result of which considerably more maize was harvested than would otherwise have been the case. The crop is, however, still inadequate for the nation's requirements and allocations for human and animal consumption had to be curtailed from time to time during the year. Efforts at importing maize, chiefly from the Argentine, were successful.

Kaffircorn.

Table XXII shows the estimated kaffircorn crop for the seasons 1938-39 to 1945-46, as well as the average annual prices for the relative crops.

TABLE XXII.—*Estimated Crop and Average Prices of Kaffircorn*

	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.
Estimated crop (in thousands of bags of 200 lb. each)....	732	587	729	555	1,432	1,473	558	788
Average price	s. d. 8 9	s. d. 16 7	s. d. 18 8	s. d. 24 11	s. d. 21 7	s. d. 18 6	s. d. 20 6	s. d. 59 7*

* Average for May-August, 1946.

The table reveals that the kaffircorn crops were exceptionally good during the 1942-43 and the 1943-44 seasons, the Transvaal crop being approximately three times as large as usual, probably because of the good rains which fell in the western and northern drier parts of the province.

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Prices fluctuated from season to season and showed a rising tendency over the whole period, partly owing to the continued maize shortage. At the beginning of 1945, kaffircorn was also placed under control with a maximum price of 22s. 6d. per bag, which was, however, fixed at 20s. 6d. per bag as from 1 May 1945. The supply of kaffircorn offered to the controlling body (the Maize Control Board) during the selling season was so small, however, that control was lifted in May 1946, after which the price immediately rose to about £3 10s. per bag. Subsequently, however, the price declined fairly sharply, to 48s. 5d. per bag in August.

The past year was more favourable for kaffircorn than the previous one because of the good rains which fell in the drier western and northern areas of the Transvaal at the beginning of 1946.

Hay.

The unfavourable climatic conditions during the year had an exceptionally detrimental effect on lucerne production, but on the other hand the late rains were favourable for the production of teff. Grazing was poor during the summer months, but the late rains and the exceptional mildness of the winter up to July, coupled with the lateness of the maize crop, ensured an abundance of roughage in most parts of the country.

As far as lucerne hay is concerned, market figures do not reflect the actual position. Owing to the shortage of maize and protein feeds, lucerne was largely disposed of by direct sale. Nonetheless Johannesburg market figures show that for the year (up to the end of August 1945) a total of 250,182 lucerne units of 100 lb. were sold as against only 47,292 units in 1946. On the other hand railway transportation figures for the most important lucerne areas for the eleven months ending June 1946, show that a total of 204,000 tons were transported, as against 181,843 tons during the same period up to June 1945.

In contrast to this, there has been a considerable increase in the sale of teff on the same market. For the year (up to August 1946), 148,703 100 lb. units were sold, in comparison with 69,895 in 1945.

Owing to unfavourable climatic conditions and the shortage of maize and protein feeds, the demand for lucerne was exceptionally heavy with prices at the maximum practically throughout the period.

In order to maintain quality, it was prescribed by regulation that lucerne hay shall not contain more than 15 per cent. of foreign feeds. The following price fixations were made known during the year (from 16 November 1945)—

Maximum selling prices, per 100 lb.

	Lucerne.	Teff.
	s. d.	s. d.
For producers.....	6 0	5 0
For co-operative societies.....	6 3	5 3
For traders.....	6 9	5 9
To consumers.....	7 0	6 0

These prices may be increased by the amount of railage actually paid, plus 1d. per mile per 100 lb. for motor delivery.

The trend of lucerne and teff-hay prices on the Johannesburg market during the war is indicated in Table XXIII.

TABLE XXIII.—Average weighted price per 100 lb. for *Lucerne* and *Teff* on the Johannesburg Market, 1939-40—1945-46.

Year.	Lucerne.	Teff.
	s. d.	s. d.
1939-40.....	3 0	2 6
1940-41.....	4 2	3 3
1941-42.....	5 7	4 7
1942-43.....	5 5	5 5
1943-44.....	5 4	4 5
1944-45.....	6 4	4 9
1945-46.....	6 6	4 8

Lucerne meal.—The price of lucerne meal was fixed at 8s. 9d. per 100 lb. for meal derived from baled lucerne, and 8s. 3d. for meal from loose lucerne. This price may be increased by 6d. per 100 lb. for handling costs plus 1d. per mile (with a maximum of 9d.) per 100 lb. for motor delivery.

Oat hay.—On 11 January 1946, the price for oat hay was fixed as follows:—Dry, 4s. 6d. per 100 lb. unbaled and 5s. 3d. baled, plus 9d. handling costs and railage and 1d. per mile for motor delivery. The prices for fodder oats were fixed at 7s. 6d., 6s. 6d. and 2s. 6d. per 100 lb. for 1st, 2nd and low grades respectively. These prices may be increased by the cost of the bag, railage and 1s. handling costs, plus 1½d. per month after 1 April 1946.

Potatoes.

Production was considerably extended during the past year up to August 1946. Nevertheless, the Food Controller had to resort to controlling supplies and provisions for about four weeks from 26 October to 26 November 1945 in order to ensure equitable distribution.

Crop estimates are given below, together with the annual weighted average prices on the Johannesburg market.

Year.	Crop Estimate.	Weighted Average Prices.
	Bags.	Per Bag. s. d.
1938-39.....	2,893,000	6 7
1939-40.....	2,266,000	6 7
1940-41.....	2,522,000	13 10
1941-42.....	2,426,000	19 0
1942-43.....	2,941,000	13 3
1943-44.....	2,155,000	16 4
1944-45.....	2,600,000	22 1
1945-46.....	2,865,000	28 10

Price Determinations.

As a result of the compulsory grading of potatoes on the nine main markets, a price was fixed during July 1945 for each individual grade according to the stage in the movement from producer to consumer. On 17 August 1945, price increases of 3s. to 3s. 6d. per bag for the good qualities, and 2s. for third grade potatoes were

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announced, these prices being again modified in September to provide for sales by market masters. Although market prices declined, these high fixed prices were maintained until March 1946, when fixed prices were reduced to the level noted for July 1945. The increasing shortage of good potatoes led to the re-introduction of the high price level as from 16 August 1946. At the close of the departmental year the following fixed prices were in force:

Potatoes.	1st Grade.		2nd Grade.	3rd Grade.	Under-grade.
Sales.	Classed.	Unclassed.			
	s. d.	s. d.	s. d.	s. d.	s. d.
Producer: Dealer.....	34 6	33 6	27 6	22 6	} 15 0
Producer: By Auction.....	35 3	34 3	28 3	22 9	
Producer: Market master....	37 9	36 9	30 0	24 3	
Producer: Consumer.....	38 6	38 0	31 6	26 0	
For quantities less than 150 lb. to consumers	10d. per 3 lb.	10d. per 3 lb.	11d per 4 lb.	7d. per 3 lb.	

Seed potatoes, which were scarce during the war years, have become fairly plentiful again and to all appearances crops will in future be adequate to meet the domestic demand at reasonable prices.

Vegetables.

Vegetable production developed tremendously from 1939 up to the end of 1945, as is reflected by the sales of seven items (onions, sweet potatoes, tomatoes, green beans, green peas, cabbage and cauliflower) on eight municipal markets in the Union.

Sales of seven vegetable items on eight municipal markets.

Year.	Tons.
1939.....	79,593
1940.....	81,118
1941.....	89,539
1942.....	105,917
1943.....	106,148
1944.....	127,083
1945.....	133,497

Vegetable prices generally also showed a sharp upward tendency over the period.

TABLE XXIV.—*Weighted average prices for seven vegetable items on the Johannesburg market 1939-40—1945-46.*

Vegetable.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Onions (Cape), bag....	9 10	12 3	13 11	14 0	18 9	18 5	14 11
Sweet Potatoes, bag...	5 7	7 3	9 10	9 8	12 0	17 3	14 11
Cabbage, bag.....	3 5	5 10	8 10	5 6	11 1	9 7	10 1
Cauliflower, bag.....	3 0	3 11	5 9	5 0	9 2	7 5	8 4
Green beans, pocket...	1 8	1 11	2 7	3 1	3 8	3 7	3 4
Green peas, pocket....	2 4	2 8	3 11	3 3	4 11	4 9	5 11
Tomatoes, N.M. Gr. I, box.....	2 1	2 7	3 1	3 4	5 5	4 1	4 11

Throughout the war there was such a heavy demand for vegetables that the supply seldom exceeded it to any appreciable

extent, and was frequently unable to meet it. During the winter of 1946 there were, however, signs of glutting on the Cape Town market, as a result of the exceptionally favourable season, which led to a considerable decline in prices.

Tobacco.

The world shortage of tobacco caused an enormous rise in prices. In the case of Southern Rhodesia the past season's crop of 41·5 million lb., sold by public auction, yielded a total of £5,600,000 which averages 31·25d. per lb.

The Union's crop for 1945-46 was considerably larger than that of the previous year, and the present crop is estimated at 5 per cent. higher than that of 1945-46, despite the decline in the figures for Turkish tobacco. The figures for the years 1938-39—1946-47 in respect of the various classes of tobacco are as follows:—

TABLE XXV.—*Tobacco crops in the Union from 1939-40 to 1946-47.*

Crop Year.	Turkish.	Virginian.		Total.
		Flue-cured.	Air-cured.	
	lb.	lb.	lb.	lb.
1939-40.. .. .	835,549	5,774,290	17,627,177	24,237,016
1940-41.. .. .	328,654	13,080,166	25,538,973	38,947,793
1941-42.. .. .	485,192	8,362,211	14,172,145	23,019,548
1942-43.. .. .	596,230	9,459,848	14,409,861	24,465,939
1943-44.. .. .	406,195	10,522,199	21,136,900	32,065,294
1944-45.. .. .	532,823	8,508,020	15,357,669	24,398,512
1945-46.. .. .	786,089	13,773,760	18,034,491	32,594,340
1946-47*.. .. .	550,000	15,715,000	17,984,000	34,249,000

* Estimated.

The extent of tobacco consumption can be deduced from the quantity manufactured. During the calendar year of 1945 more than 33 million pounds were manufactured—an increase of 300,000 pounds, compared with the previous year. The increase is distributed over all classes of tobacco, as is clearly shown by the following figures:—

TABLE XXVI.—*Manufacture of Tobacco 1938-1945.*

Calendar Year.	Turkish.	Flue-cured.	Air-cured.		Total All Classes.
			Light.	Dark.	
	lb.	lb.	lb.	lb.	lb.
1938.. .. .	770,000	6,219,000	6,679,000	9,141,000	22,809,000
1939.. .. .	752,000	7,441,000	6,208,000	9,383,000	23,784,000
1940.. .. .	864,000	8,922,000	5,803,000	9,663,000	25,052,000
1941.. .. .	760,000	11,251,000	6,253,000	10,527,000	28,791,000
1942.. .. .	624,000	12,105,000	7,854,000	9,416,000	29,999,000
1943.. .. .	633,000	13,955,000	7,702,000	8,000,000	30,290,000
1944.. .. .	551,000	15,443,000	6,798,000	7,294,000	30,086,000
1945.. .. .	628,000	17,376,000	7,527,000	7,530,000	33,061,000

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TABLE XXVII.—*Union Imports of Tobacco (1938-1945.)*

Calendar Year.	Turkish.	Virginian.		Total All Classes.
		Flue-cured.	Air-cured.	
	lb.	lb.	lb.	lb.
1938.....	194,854	2,789,060	235,052	3,218,966
1939.....	2,481	3,443,218	206,718	3,652,417
1940.....	2,487	1,911,782	448,858	2,363,127
1941.....	573	1,548,004	381,036	1,929,613
1942.....	—	4,035,456	352,906	4,388,362
1943.....	—	5,818,403	540,915	6,359,318
1944.....	—	10,802,997	310,175	11,113,172
1945.....	—	1,350,726	367,643	1,718,369

Over the seven-year period, an annual average of 4½ million lb. was imported. Under agreements, a total of 400,000 lb. of tobacco is annually imported duty-free from Northern Rhodesia. Admissions from Southern Rhodesia were determined as follows:—

Duty-free Admissions from Southern Rhodesia.

Year.	Quantity. lb.
1936-37.....	2,006,000
1937-38.....	3,188,000
1938-39.....	2,000,000
1939-40.....	3,000,000
1940-41.....	1,000,000
1941-42.....	3,000,000
1942-43.....	2,000,000
1943-44.....	4,500,000
1944-45.....	10,000,000
1945-46.....	1,500,000
1946-47.....	3,000,000

Owing to the shortage in the Union, especially as far as light-leaved varieties are concerned, these imports as well as the Union's own production are still subject to allocation between manufacturers. A start was also made this year with the allocation of duty-free imports from Northern Rhodesia.

The average crop for the seven years up to 1945-46 is 28·53 million lb. Against this, the consumption averaged 28·72 million lb. over the same period. An annual average of 4·50 million lb. was imported, and although this should have led to an accumulation of supplies, this is not found to be the case.

Virginian types only were exported during 1945-46, i.e. 259,217 lb. on which an amount of £3,390 was paid out in premiums by the Tobacco Board. Exports were largely restricted to Sweden, viz. 236,417 lb. in 1946.

The Union's crop is handled by 10 co-operative organizations at various centres in the country, while 112 manufacturers and wholesalers have undertaken the distribution.

With the approval of the Minister, the Board has raised prices by 10 per cent. i.e. as far as the producer is concerned prices are now the basic price plus 55 per cent. The basic price is based on the level of producer's prices for the various grades of tobacco in 1939.

Chicory.

The demand for this product doubled itself during the war period. High prices for coffee and the shortage of tea probably also

contributed to this development. Inadequate production in the Union and the import difficulties made rationing inevitable. Since no seed had previously been grown locally and owing to the difficulty experienced in obtaining seed, production could not be expanded and the shortage of roots continued. Attempts are at present being made to increase production to meet trade requirements and at the same time to abolish the existing system of rationing the trade.

TABLE XXVIII.—*Production since the Establishment of the Chicory Industry Control Board.*

Year:	Production.	Prices per 100 pounds.		
		First Grade.	Second Grade.	Third Grade.
	lb.	s. d.	s. d.	s. d.
1945-46.....	5,267,000	35 0	30 0	25 0
1944-45.....	6,301,000	35 0	30 0	25 0
1943-44.....	6,623,000	32 0	30 0	27 0
1942-43.....	5,324,000	32 0	30 0	27 0
1941-42.....	4,918,000	29 0	27 0	24 0
1940-41.....	6,923,000	26 0	24 0	21 0

As can be seen from the above prices, it was the policy of the Board to keep prices as low as possible. Price determinations according to grade were gradually increased to 35s., 30s. and 25s. per 100 lb. for the three grades for the year under review. The price of first-grade chicory will be raised from 35s. to 36s. for the following year. The levies payable by producers were maintained at 2s., 1s. 6d. and 1s. 3d. per 100 lb. for the respective grades.

Contracts have now been concluded overseas for sufficient seed to double production.

The Board at an early stage secured an adequate supply of bags for the marketing of the crop for several years to come.

The Board has also taken steps to provide manufacturers with an improved product, and is undertaking dehydration experiments with the fresh root. Further developments are being awaited.

Oil Seeds.

The Union's low production makes the country dependant on imports, and consequently the shortage of fats in Europe, especially vegetable fats, has detrimentally affected supplies to the Union, with the result that here, too, serious shortages developed. The allocation to the Union of only a small portion of the country's requirements from available world supplies, seriously affected both our oil and our feed position. It is now imperative that the country should, at least for the present, become self-supporting.

Plans for an increased production have been drawn up and efforts are being made to encourage the planting especially of groundnuts and soybeans. Seed is being made available for this purpose.

Ground Nuts.

The past year's crop was estimated at 240,000 bags which, although still low, showed a gratifying improvement on that of the previous year.

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Owing to the shortage of oil seeds in general, the demand for this product is enormous and prices are tending towards higher levels. Maximum prices have again been introduced although on a higher basis.

The producers' price at present is 35s. per 100 lb. unshelled with a minimum kernel content of 60 per cent., and 55s. per 100 lb. shelled. Seed prices have been raised to 120s. per 200 lb.

As the shortage of oil seeds became more acute, the danger of black marketing increased and it was decided to place the existing supplies under the control of the Controller of Food Supplies. At present all sales are regulated by this organization.

The Groundnut Advisory Committee, which was dissolved during 1944, was recently re-established on a modified basis designed to extend representation to the new producing areas.

Production and prices of groundnuts during the past few years were as follows:—

Year.	Production (100 lb. bags).	Prices per 100 lb. (60 per cent. kernel content).
		s. d.
1937-38.....	213,000	10 0
1938-39.....	298,000	11 2
1939-40.....	213,000	10 9
1940-41.....	172,000	12 1
1941-42.....	122,000	20 0
1942-43.....	256,000	21 0
1943-44.....	243,000	25 0
1944-45.....	142,000	28 3
1945-46.....	250,000	35 0

Citrus Fruit.

Table XXIX shows the production, in 65 lb. boxes, of citrus fruit in the Union for the years 1940 to 1945, as well as the quantities exported over the same period:

TABLE XXIX.—*Production and Export of Citrus Fruit, 1940-1945:—*

Year.	Production.	Export.
	Boxes.	Boxes.
1940.....	6,500,000	3,864,000
1941.....	6,900,000	2,049,000
1942.....	7,100,000	2,303,000
1943.....	7,250,000	1,247,000
1944.....	7,600,000	985,000
1945.....	6,600,000	2,757,000

Despite increased production during the war and the diminished export, the Citrus Board succeeded in disposing locally of a steadily increasing volume of citrus fruit.

The crop for 1946 was detrimentally affected by drought and is estimated at 3,278,000 boxes of export quality, of which 1,370,336

boxes were exported up to the end of August, 1946. Up to the middle of August, 1946, about 2,800,000 pockets of citrus fruit were sold in the Union from an estimated total of about 6 million pockets for the Union market.

This is approximately one million bags less than the corresponding figures for 1945.

The even distribution of citrus in the Union was capably managed by the Board, and the establishment of citrus sales depots in certain cities led to increased consumption and lowered distribution costs.

The receipts from local sales as well as from exports of citrus were pooled and paid out to growers after deduction of expenses.

Citrus fruit was exported to England at agreed prices fixed from time to time. Since 1943 local maximum prices have been fixed by the Price Controller. The citrus pool payments per box were as follows:—

	s.	d.
1940.....	4	0
1941.....	3	5
1942.....	4	3
1943.....	2	7
1944.....	2	3
1945.....	7	1·97

The comparatively low payments made during 1943 and 1944 were due to the relatively small export, as a result of which a larger percentage of the crop had to be sold at the lower local prices. The payments during these two years were, however, raised by subsidy to 3s. 5d. per box for smaller producers.

Deciduous Fruit.

The deciduous fruit industry was even more seriously affected by the war than the citrus industry, since all export to England was suspended as from 1940.

The industry was, therefore, virtually restricted to the local market. Whereas during 1938 and 1939 an average of 35,813 tons of fresh fruit was still exported, the export of the 1940-41 season amounted to only 21 tons.

Owing to the suspension of exports, the Deciduous Fruit Board was authorised to take over the normally exportable fruit crop and dispose of it locally. The Board therefore had to find a market for the deciduous fruit crop, which was steadily increasing as can be seen from the following figures.

Quantities of Deciduous Fruit handled by the Deciduous Fruit Board.

Year.	Tons.
1940-41.....	31,803
1941-42.....	44,155
1942-43.....	46,995
1943-44.....	66,978
1944-45.....	64,260
1945-46.....	54,437*

* Represents peaches, plums, pears and grapes.

In pursuance of the recommendations of a commission appointed to investigate matters relating to the deciduous fruit industry, the Deciduous Fruit Board was given full control over the marketing of plums and pears as from 1941-42, and subsequently of peaches and grapes.

As a result of the loss of the profitable overseas market, the Government made an annual contribution averaging £275,000 during the period 1940-41 to 1945-46 for the support of the deciduous fruit industry.

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In addition, loans were granted to farmers through the Board, to finance production and the purchase of packing material.

In general, prices paid to producers for fruit received by the Board show a rising tendency over the six years 1940-41 to 1945-46, as is shown in Table XXX.

TABLE XXX.—Average prices to farmers for fruit received by the Deciduous Fruit Board.

	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Plums: Bulk, Gr. I, per ton.....	8 6 8	9 7 6	—	10 5 0	14 0 0	14 0 0
Peaches: Single-layer tray, Gr. I	0 1 9	0 2 0	0 2 6	0 2 6	0 3 0	0 3 0
Pears: Per box, Gr. I.....	0 6 8	0 6 10	0 7 5	0 8 3	0 10 5	0 10 6
Grapes: Nett (packing excluded), Gr. II, per ton..	12 10 0	14 11 8	20 16 8	17 14 2	18 15 0	20 16 8

Dried Fruit.

Total production figures for the past nine years (1937-1945) were as follows:—

	lb.
1937.....	28,858,842
1938.	26,015,636
1939....	26,553,252
1940.....	32,875,276
1941....	25,489,523
1942....	37,657,175
1943..	36,440,099
1944..	36,973,781
1945.	34,783,786

During the 1946 season approximately 15,500 tons of dried fruit were produced as against 17,400 tons in 1945. Sultanas were considerably lower (2,004 tons as against 3,400 tons in 1945) and apricots only approximately 150 tons as against 680 tons in 1945. The total production of tree fruit was approximately 3,400 tons as against 4,435 tons in 1945. In comparison with 1944, therefore, this year's dried tree-fruit yield showed a decrease of almost 1,800 tons. This large decrease was due mainly to the increased demand for fresh fruit for canning purposes and to the failure of the apricot crop.

Owing to this decrease in production and the expected suspension of the Export Regulations, packers endeavoured to take in as much fruit as possible. Consequently only 1,000 tons of raisins could be exported this year. The production of peaches was hopelessly inadequate and the same applies to apricots. Packers hope to be able to import about 900 tons of prunes.

Pools were again established in respect of raisins, sultanas, currants and apricots (fresh as well as dried) and agents had to take in all these dried fruits on behalf of the Dried Fruit Board. There were no export losses, except on raisins, and on the whole, prices to producers were therefore slightly higher than in 1945, which was itself a record year. No pool deficits are expected this year.

Since 1944, prices were determined for all types of dried fruits, with the exception of specially dried vine fruits. This work is being continued as far as possible. The Board expects to take full control again and negotiations are at present conducted with the National Marketing Council in order to stabilize control over dried

fruit and to control dried fruit under the regulations of the Marketing Act instead of under war measures as has been the case up to the present. Prices paid by the various pools were as follows:—

TABLE XXXI.—*Pool prices for sultanas, raisins and apricots in pence per pound. 1939-40—1944-45.*

Year.	Sultanas.	Raisins.	Apricots.
	(Per lb.)	(Per lb.)	Per lb.)
	d.	d.	d.
1939-40.....	2.25	2.00	6.75
1940-41.....	2.25	2.39	6.75
1941-42.....	3.14	2.93	9.50
1942-43.....	3.24	5.11	9.51
1943-44.....	3.50	3.38	11.52
1944-45.....	3.74	4.54	10.24

The existing grading regulations were revised and published during the year. Various further amendments are required, however, and the matter is receiving the attention of interested parties. The aim is, by means of price manipulations for the different grades, to encourage producers to market a better product.

Viticulture.

The total annual vine crop for the past seven years is given in Table XXXII which also reflects the crop in terms of leaguers used for making distilling wine, good wine including wine for the farmer's own use, and for raisins and sultanas.

TABLE XXXII.—*Total Vine Crop 1939-1945.*

Year.	Crop in terms of Leaguers of 20 Per Cent. Proof.	Distilling Wine.	Good Wine.	Raisins and Sultanas.
1939.....	290,308	187,091	82,258	20,959
1940.....	326,053	223,047	86,129	16,877
1941.....	396,711	151,684	196,388	48,639
1942.....	435,736	187,834	192,675	55,227
1943.....	440,788	243,347	143,682	53,759
1944.....	509,792	287,315	165,030	57,447
1945.....	469,716	305,310	107,452	56,954

The following prices were paid to farmers for wine per leaguer:—

Year.	1941.	1942.	1943.	1944.	1945.	1946.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Distilling Wine....	4 2 6	4 14 4	5 12 6	5 10 4	5 16 5	5 16 5
Good Wine.....	6 0 0	6 5 0	7 0 0	7 0 0	7 10 0	8 0 0
Quality Wine.....	10 0 0	10 5 0	11 0 0	11 0 0	11 10 0	12 0 0

Inland Marketing.

Intelligence Service.—As in the past, market reports consisting of market prices and a review of marketing conditions were furnished to the press, the radio and interested persons and business concerns.

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As from February 1946, a daily instead of a weekly market bulletin for housewives has been furnished to the radio and to the press.

Since 17 June 1946, a general view of supplies and average prices on the 9 major markets of the Union is given over the radio. Producers therefore receive daily information in regard to comparative prices on the various markets.

With the resumption of wool auctions, weekly wool reports have been given to the radio and the press as before the interruption caused by the war.

The National Mark Scheme.—Registrations of producers under this scheme are steadily increasing.

In the case of tomatoes there were no fewer than 203 new registrations consisting mainly of farmers in the neighbourhood of the Rand where tomato production is steadily increasing. Considerable increases also occurred in the case of green beans and green peas, with 98 and 81 registrations respectively.

As a result of the introduction of the compulsory grading schemes in respect of citrus fruit, deciduous fruit, potatoes, eggs and meat, the National Mark was discontinued in these cases.

Interest in registration is a heartening sign since it is an indication that producers are realizing more and more the advantages of grading, especially when production is high.

The following figures show the increase in offerings under the National Mark for certain products on the Johannesburg market since 1937-38:—

	1937-38.	1945-46.
Tomatoes (boxes).....	246,549	1,044,946
Papaws (standard boxes)	53,964	86,834
Strawberries (punnets).....	360	44,350
Dressed poultry (head).....	26,851	110,432

The fact that producers are at present better informed in regard to grading than some years ago, is reflected in the following figures from the Johannesburg market:—

Percentage approved, of the quantity offered under the National Mark Scheme:—

	1942-43.	1945-46.
Tomatoes	87.3	91.4
Papaws	86.6	91.7
Avocados.....	87.3	99.6

Compulsory Grading.—The following schemes were again applied by the branch offices.

1. Compulsory grading scheme for citrus fruit.
2. " " " " deciduous fruit.
3. " " " " potatoes.
4. " " " " eggs.
5. " " " " meat.

The following figures give an indication of the extent of the work in connection with the schemes:—

	<i>Quantities Inspected (Johannesburg only). 1945-46.</i>
Potatoes.....	788,063 bags.
Grapes.....	401,460 half lug-boxes.
Apples.....	129,386 trays.
Oranges.....	1,156,779 pockets.
Eggs.....	1,748,640 dozen.
Sheep and lambs.....	639,672 carcasses.

Apart from meat grading which has now been carried out at the Rand abattoirs for several years a more or less regular inspection service has been introduced on all east and west Rand markets for deciduous fruit, potatoes and eggs. East and west Rand towns have not as yet been proclaimed controlled areas for citrus fruit. Inspection on the east and west Rand markets consisted mainly of test inspections, since the majority of the market-masters made available a staff member to help with the inspection under the guidance of the inspector of the Division.

In order to ensure compliance with the regulations by retailers, the latter are visited regularly and prosecutions instituted where necessary. In Johannesburg alone, about 1,000 such visits were carried out during the past year, and 25 per cent. of these resulted in prosecutions (Rand towns included). During the past year, courts have been regarding violations of this type in a serious light and have imposed more severe penalties.

Extension work in connection with grading and packing could be undertaken on a larger scale among producers not too far removed from the branch offices. In the case of potatoes, where compulsory grading had been in force for only a year, a considerable amount of extension work was undertaken. In addition, useful information was also gained on these extension tours, in regard to crops, general conditions, etc.

Food control.—During the year, the branch offices were still responsible for extensive activities on behalf of the Food Control Organization, such as the buying and handling of eggs, potatoes and other vegetables.

The distribution scheme was further extended and in addition to the existing depots at Pretoria and Cape Town, new depots were opened at Port Elizabeth, Kimberley, East London, Durban, Bloemfontein and Pietermaritzburg.

All the officers in charge of branch offices are now members of the Regional Food Committees appointed in their areas.

General Activities.

The activities of the Division were seriously hampered during the war years. Scientific research, with the exception of a few cost investigations, was practically brought to a standstill.

Although the general policy during the war was to continue only with the most essential research work, the staff position gradually deteriorated to such an extent that urgent investigations of a special nature could hardly be carried out in time.

As an indication of the staff position, it may be mentioned that since 1939 the Division lost the services of 17 members of the professional staff.

A number of the professional officers were also seconded to other Government Organizations.

After having been suspended during the war, bursaries for overseas study were again made available during the past year, and of the newly appointed staff members, of whom six junior professionals are still with the Division, 3 went overseas this year for further study.

During November, 1945, the Division lost the valuable services of both its chief, Dr. J.F.W. Grosskopf who retired, and its Assistant Chief, Mr. J. I. Raats, who was appointed Director of Census and Statistics. They were succeeded by members of the Division, Messrs. S. J. J. de Swardt and C. H. Spamer respectively.

The domestic marketing service was considerably extended during the war and shouldered more and more duties. The service, which

was originally only of a temporary nature, became permanent in 1942 and it is expected that the few temporary posts still attached to this service will be made permanent in the near future. Difficulties are however, still being experienced in retaining the necessary trained personnel, especially for grading duties, as at present in the case of meat.

As mentioned before, research work undertaken during the war was mainly of a specialized nature and was carried out under special instructions, as for example: Cost investigation in connection with potato production, 1942-43; dairy production in the western and eastern Cape Province, East Griqualand, eastern Orange Free State, eastern Transvaal, Natal and the north-western Cape Province in 1943-44 and 1944-45; egg production by specialist poultry farmers in Natal, Transvaal and the western Cape Province, in 1944-45; and vegetable production under the Bon-Accord scheme in 1944-45.

With the return, however, after the cessation of hostilities, of officers who had been seconded to other departments, the Division resumed its investigational duties and, although the staff shortage remained serious, an energetic programme was undertaken during the past year.

During the past year, too, the Division resumed the classification of the country into agro-economic areas, which had been suspended during the war.

The field work in respect of the western Orange Free State, Western Transvaal, the Kalahari and the bushveld areas of the Transvaal has been completed. Reports in regard to 20 agro-economic areas have also been completed, and the majority are ready for publication.

Towards the middle of 1946 an Advisory Agro-economic Regional Committee was constituted on which the Divisions of Economics and Markets, Soil Conservation and Extension, Agricultural Education and Research, Botany and Plant Pathology and Chemical Services were represented. The Agricultural Research Institute, which is attached to the University of Pretoria, was co-opted for work in connection with the summer-rainfall area, and the Stellenbosch-Elsenburg College of Agriculture for work in connection with the winter-rainfall area. This committee forms a useful link between the various Departmental bodies, with a view to ensuring the necessary co-ordination between the different co-operators taking part in this important work.

During the year a farm-bookkeeping and costing project was approved and introduced by the Division. The purposes of this project are *inter alia*, to obtain reliable production and cost data from a number of representative farmers in each of the most important agricultural areas, which may serve to supplement and check information gathered through field surveys for research purposes. Under the project, farmer co-operators are assisted by professional officers of this Division in keeping and completing the various account forms. The project is also connected with the demonstration farms of the Division of Soil Conservation and Extension. Up to the present, the project has been put in operation on the Transvaal Highveld for dairy and mixed farming; in the western Cape Province for viticulture and fruit culture, and in East Griqualand for dairy farming.

During the year a country wide farm labour investigation was commenced, with special reference to the economic and social aspects of farm labour. The field work in the winter-rainfall area has been completed and the data are at present being elaborated.

The revision of the various price index series kept by the Department, was also commenced and this work is being continued.

Chemical Services for the State.

J. P. van Zyl, B.A., Ph.D., Chief of the Division of Chemical Services.

THE work of the Division during the year was greatly influenced by two factors, namely, (a) staff difficulties, and (b) increased demands for services by various Departments and institutions. These two factors work in opposite directions and have made the position very difficult. This Division, however, is not the only one in this position.

Regulatory Work.

1. Pretoria.

The work of the Pretoria Laboratory may be roughly divided into three main groups, namely, (a) soil survey, (b) soil fertility, and (c) general and industrial.

(a) *The Soil Survey Group* was fully occupied in rendering services to various bodies. The following is a summary of the work undertaken during the past year by this Section:—

- (i) The survey of the Crocodile-Thabazimbi Irrigation Project was completed for the Irrigation Department by the end of 1945.
- (ii) The Bospoort-Scheme at Rustenburg was surveyed for the Irrigation Department with a view to its extension.
- (iii) Since April 1946, three soil survey parties have been engaged in an investigation of the Orange-Fish-Sundays Rivers Project, with its possible extensions. This undertaking for the Irrigation Department will last several years.
- (iv) The intensive survey of the Loskop Scheme was completed in September 1945 for the Lands Department.
- (v) In connection with soil reclamation, assistance was rendered to the Departments of Lands and Irrigation with regard to brak and water-logging on various irrigation schemes.
- (vi) The survey of the Rooikraal Settlement, Middelburg, was completed for the Lands Department by the end of 1945.
- (vii) Services were rendered to the Native Affairs Department in connection with the rehabilitation of native areas in the Ciskei and Transkei and in the Transvaal.
- (viii) The Hellenic College Farm, Rooikraal, Heidelberg, was surveyed at the request of the Division of Soil Conservation and Extension.
- (ix) An officer of this Division co-operated in carrying out an agro-economic survey of the western Orange Free State, Bechuanaland and Northern Transvaal for the Division of Economics and Markets.
- (x) At the request of the Resident Commissioner of the Bechuanaland Protectorate, a visit was made to that region to advise on irrigation schemes and soil reclamation.

CHEMICAL SERVICES FOR THE STATE.

- (xi) Professional assistance was given to the East London Municipality in a case before the Water Court, and to the South African Railways and Harbours Administration in connection with the expropriation of property.
- (xii) Requests for the services of the soil survey section were made in connection with Regional and Town Planning Schemes.

(b) *The Soil Fertility Section* is greatly hampered by the lack of a suitable pot-house, by resignations of staff, and by the fact that the colleges of agriculture are hardly in a position to undertake any extra work. However, advisory work on soils from farmers and small-plot holders based on rapid methods of analysis, was continued and about 50 to 100 samples of soil were examined per month.

(c) *The General Section* covers a wide field of work. Insecticides and weedkillers are receiving considerable attention, and much work has been done on emulsions and emulsifying agents.

Analyses of water were carried out for the Industrial Development Corporation, for the farming community for irrigation purposes, and for the Irrigation Department. Assistance and advice were also rendered to industries on water supplies and requirements and on industrial effluents. For irrigation purposes alone, about 420 samples of water were analysed, whilst 200 samples of manures, composts and fertilizers were analysed during the year, in addition to the analysis of grasses, fodder and soils undertaken for various research stations and for co-operative experimental work.

Analysis of rocks and minerals were carried out for (a) the geological survey, (b) the public, (c) the universities, through the Council for Scientific and Industrial Research, and (d) export purposes for the Department of Mines. The work under (c) was undertaken to assist the research efforts of the university staffs. For these purposes altogether 300 samples were analysed.

Work on percussion-cap compositions, metals and alloys, etc., was carried out for the Department of Defence.

In addition, a large amount of advisory work was carried out for various bodies and institutions, such as the Department of Defence, the Divisions of Veterinary Services, Entomology, Horticulture and the Research experiment stations. Much time was devoted to the work of drawing up standards of various products such as D.D.T., paper, oils, etc., in co-operation with the Bureau of Standards.

The staff of the Government Printing Works Chemical Laboratory has had to be augmented owing to the considerable increase in the volume of work.

2. Johannesburg and Cape Town.

The normal work of the Johannesburg and Cape Town laboratories is similar in nature and consists mainly of regulatory work under various acts such as the Foods, Drugs and Disinfectants Act; Wine, Spirits and Vinegar Act; Agricultural Export Act; Fertilizers, Farm Foods and Pest Remedies Act, as well as work for the Departments of Customs and Excise, Justice, Public Health, and Mines and general work for the Public Works Department, the Provincial Administration and other institutions.

During the year 6,500 samples were analysed in the Johannesburg Laboratory, of which 2,630 were examined under Act 13 of 1929. Some 195 samples, mostly milk, failed to comply with the regulations under this Act. Under Act 15 of 1913, 450 samples were analysed, and 89 were found to fail, whilst 840 samples were examined for Customs purposes and 801 exhibits analysed for the Department of Justice. In both these cases there was a rapid increase in the work, involving a heavy burden on a depleted staff. The tariff value of the work done was about £20,000.

In the Cape Town Laboratory the distribution of the work differs somewhat from that in Johannesburg, and the major portion of the work consists of the examination of wines and spirits under Act No. 35 of 1917. During the year 13,000 such samples were examined, representing 6,500 shipments of wines and spirits. This work provides about 85 per cent. of the work in the Cape Town Laboratory at the moment. The samples analysed under Act 13 of 1929 numbered 1,190 of which 135 failed to comply with the regulations. Of the failures, 121 were milks. Some 506 samples were examined for Customs purposes, and 75 samples of imported wines and spirits. In addition, 103 gallons of Chaulmoogra esters were prepared for use by the Public Health Department in the treatment of leprosy. The tariff value of the work done in the Cape Town Laboratory was about £29,850 of which £25,170 was in respect of wines and spirits under the Agricultural Export Act.

Investigation.

Owing to the unsettled conditions it has not been possible to carry out any long-term research work and, with a shortage of staff, only immediate problems can be tackled. This is specially the case with the advisory work which occupies so much time in the Pretoria Laboratory.

The development of suitable thermal smoke generators for producing D.D.T. and other insecticidal and fungicidal smokes for general use proved successful, but the mixtures initially suggested had to be modified to overcome the dangers attached to their manufacture. The costs and efficiency of the various methods of smoke generation are being worked out. This work was carried out mainly in connection with the campaign against tsetse fly, since such generators can be used where aircraft are impracticable, but it will be extended to include other insect pests such as white ants, etc.

Investigations on organic insecticides and weedkillers are being continued and various compounds have been prepared for experimental testing. This work is being carried out in co-operation with other Divisions.

Work in connection with the dehydration of chicory has been virtually completed, a pilot plant having been operated successfully; but work is proceeding on roasting tests of the fine material remaining after the production of the dried cubes. This work was carried out in co-operation with officers of the Dehydration and Cold Storage Laboratory.

Large numbers of samples of lucerne, wheat, maize, etc., from established fertilizer trials throughout the country are being analysed to determine the quality of the products grown under different fertilizer treatments. In these experiments stress is laid upon the nutritional quality of the product rather than purely on quantity, and

valuable information is being collected. In this respect about 350 samples of wheat and lucerne were examined for the phosphate, potash and nitrogen content.

A long-term rotation on the best method of soil utilization, with chicory as a cash-crop in various rotations, was designed and established in conjunction with the Pature Research Officer at Alexandria. The fertilizer experiments conducted at Vaal-Hartz with assistance of this Section are yielding valuable results. During the year considerable progress was made with the working up of data preparatory to the compilation of a comprehensive report.

Research work on marking-fluids used for meat and for marking sheep has recently been revived.

Work has been commenced on means for assessing the freshness or otherwise of meat and fish products, since there is evidence that unsound meat or fish may be used in their manufacture, and an investigation has been started into the chemical changes taking place in bottled wines during storage. Attempts are being made to shorten the time required for the determination of arsenic in export fruit.

Publications.

During the past year 5 radio talks were provided by officers of the Division, all on fertilizers and soils. The calls made upon the staff to act in an advisory capacity render it extremely difficult to devote time to this essential function, and printing difficulties have held up the publication of pamphlets. The following publication was issued as a reprint:—

“ The Copper and Lead Content of Human Tissues.”

The following are in course of publication or ready for publication:—

“ Determination of Copper and Lead in Biological Material.”

“ Determination of Arsenic in Contaminated Soils.”

“ A Study of Some Chemical Changes occurring during the Dehydration of Vegetables.”

“ The Production of Nicotine Sulphate from Waste Tobacco.”

Dairy Production in the Union.

L. J. Veenstra, Superintendent of Dairying.

THE year, September 1945 to August 1946, was in several respects, for all the branches of the Dairy Industry in the Union, a difficult one.

A very serious drought was experienced during the spring and early summer of 1945; production fell to an unusually low level in the last quarter of the calendar year 1945 and it was well past the New Year before any improvement in this respect took place. It can rightly be said that the position was most critical in December, 1945, and early in January, 1946, when many parts of the country were in such a state that cattle farmers were beginning to despair of being able to produce sufficient food for their animals for the coming winter.

But, as has often occurred in previous years, good rains fell at the very last moment and still in time to allow of a fair growth of natural veld, which lasted well into the winter months.

The production of dairy products was therefore surprisingly good towards the end of the summer and during the autumn and early winter months of 1946, especially in those areas where the production is chiefly "off the veld".

The unfavourable climatic conditions experienced during a considerable part of the year were no doubt the main cause of the lowest total annual production of butter and cheese in the Union for several years.

An important contributory cause was the fact that concentrates were not obtainable in sufficient quantities. There was a very serious shortage of protein feeds and mealies, and as suitable substitutes were available only in very limited quantities, it will readily be understood that the dairy farmer, who depends to a large extent on the cattle feed he can purchase, had a most difficult and worrying time.

A third factor which greatly influenced the production of milk was the serious outbreak of "lumpy skin" disease, previously quite or almost unknown in the Union. This scourge suddenly made its appearance in the Transvaal during 1945 and, in a few months' time, had spread over very large areas, affecting a great number of herds in the Transvaal, Orange Free State and northern Natal.

Although the death rate among cows was light, the loss of milk was very considerable in all cases where the cows contracted the disease during the lactation period, and since many thousands of milk cows contracted "lumpy skin", the loss in milk over the whole country must have been tremendous. In the circumstances therefore, it is not surprising that the total production of milk fell very much short of the country's requirements.

The demand from the large urban centres for fresh milk has been steadily increasing, notwithstanding the fact that the retail price is considerably above that of pre-war days.

It would appear that our people generally are beginning to realize the importance of fresh milk as a food and that the consumption per capita is at present better than ever before.

To satisfy the demand for fresh milk, it was necessary to draw on the suppliers of industrial milk. In some cases producers who otherwise would have delivered their milk to cheese factories or

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condenseries, took advantage of the opportunity to become city milk suppliers, but the bulk of the additional milk required by the fluid milk trade was supplied direct by several cheese factories.

A large number of cheese factories in different parts of the Union diverted all or an appreciable portion of their milk during the months of low production to the fresh milk trade.

The Witwatersrand requirements could not be met without a considerable quantity of milk from cheese factories in the Orange Free State, situated mostly along the Bloemfontein-Harrismith railway line, whilst Cape Town had to draw on the supplies intended for the production of cheese at Bonnievale, Ladismith and centres still further away. The position at Durban was probably even more difficult and very considerable quantities of milk had to be found in districts some 100 to 200 miles distant.

It is not surprising that under these circumstances the production of cheese was much reduced, especially in the areas known as our best cheese-making districts, viz. East Griqualand and the eastern Orange Free State.

The condensing industry was affected equally seriously by the increased demand for milk in the large centres. With a large amount of capital invested in this comparatively young branch of the dairy industry in the Union, it is necessary that a sufficiently large regular output of milk be maintained, but this was not possible in the circumstances. It is understood that some of the milk-powder and condensing plants had to work at no better than half capacity during several months of the year.

There was at no time any serious shortage of fresh milk in any of our large centres, although the distributors occasionally experienced difficulty in obtaining the necessary supplementary supplies to meet their requirements.

It is fortunate that many of our cheese factories are equipped with pasteurizing and cooling plants, a fact which makes it possible for milk to be railed over long distances and assures that it will arrive in good condition.

The pasteurization of milk for the fresh milk trade has become almost universal and it would seem that local authorities are moving in the direction of making pasteurization compulsory. There can be no doubt that this would be a step in the right direction.

Many small milk plants are likely to disappear as their turn-over would not be sufficiently large to warrant the installation of expensive equipment. This need not cause any hardship to those at present engaged in the distributive trade, as arrangements will no doubt be made to safeguard their interests.

Butter.

The butter position was very adversely affected by the serious drought suffered in South-West Africa where the production was the lowest for a number of years. The six creameries operating in S.W.A. together with two small creameries in the neighbouring territories, had a total production of 7,309,893 lb. as compared with 8,498,982 lb. for the corresponding period in 1944-45.

The total output of 47 registered creameries in the Union amounted to 33,775,006 lb., as against 38,793,681 lb. produced in the previous year.

Fortunately good stocks of butter were accumulated in cold storage prior to the 1946 winter when the quantity manufactured

dropped very materially. At the commencement of the winter there were 7,500,000 lb. of accumulated stocks.

From the following table it will be seen that there has been a considerable fluctuation in production over the past eight years:—

TABLE 1.—*Production of creamery butter in the Union and S.-W. Africa (including Bechuanaland and Swaziland Protectorates).*

Year.	Union.	South-West Africa, Bechuanaland Protectorate and Swaziland.
September–August—	lb.	lb.
1938–39.....	36,461,747	11,538,184
1939–40.....	44,472,786	12,109,165
1940–41.....	45,364,725	9,215,547
1941–42.....	39,701,035	7,493,154
1942–43.....	42,462,920	12,209,879
1943–44.....	43,320,431	11,644,990
1944–45.....	38,793,681	8,498,982
1945–46.....	33,775,006	7,309,893

Practically all our creamery butter is manufactured from pasteurized and effectively cooled cream so that its keeping qualities have been radically improved since the days when butter was manufactured from raw cream.

The butterfat delivered to the creameries registered in the Union can be classified as follows:—

First Grade	92 per cent.
Second Grade	7·2 per cent.
Third Grade	0·8 per cent.

These results are satisfactory and compare favourably with the percentages indicating the quantities of butter manufactured in the various grades, which are as follows:—

First Grade	91·3 per cent.
Second Grade	7·8 per cent.
Third Grade	0·9 per cent.

The average overrun or gain between butterfat churned and butter manufactured was 20·8 per cent., which is satisfactory and shows a very slight improvement on the figure for the previous year.

Although much of the time of the technical officers of the Division was taken up by grading duties, as required under the Dairy Products Marketing Scheme, it was nevertheless found possible to carry out a good deal of check testing of cream by taking samples of cream in transit from farm to factory.

It is the practice to have such samples taken and tested in duplicate to ensure that no error can possibly be made, and the official result as conveyed to the producer of the cream is therefore absolutely reliable. Minor differences between the official check tests and the creamery results must be expected, but from the evidence collected during last year and in previous years it is clear that, generally speaking, the suppliers have had little reason to suspect any malpractice on the part of the creameries in respect of the butterfat tests returned.

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On the other hand, officers of the Division are convinced that some creameries have placed many a can of cream in a grade to which the cream was not rightly entitled. The practice of grading too leniently often results in the quality of the butter being reduced to the minimum required for the grade. But an even more dangerous effect is apparent in the case of some suppliers who do not accord due care and attention to their milk and cream and who only desire their cream to be paid for at the highest rate.

If creameries continue to grade too leniently, serious consequences must eventually result and suppliers and manufacturers can only expect to experience disappointment when it becomes necessary to enforce strict grading.

Under the Marketing Act all creamery butter must be graded before it is sold to the consumer. A total quantity of 33,364,152 lb. of creamery butter was graded by officers of this Division during the period under review. This total represented 29,873,828 lb. first grade, 3,130,149 lb. second grade and 360,176 lb. third grade, as presented by the creameries. Of the first grade 97·4 per cent. was passed as first, 2·4 per cent. was degraded to second and 0·2 per cent. to third grade. Of the second grade 96·8 per cent. was passed in the second grade and 3·2 per cent. was degraded to third grade. The third grade butter all passed in that grade. On the whole, these results are satisfactory.

The consumption of butter was 40,165,702 lb. for the period under review. Included in this quantity is a total of 257,220 lb. provided as ships' stores and exported to neighbouring territories, while 131,980 lb. of butter was imported.

TABLE II.—*Prices paid (per lb.) to suppliers for butterfat.*

Period.	Basic Price per lb.			Winter. Premium.	Total Price to Supplier.		
	Grade 1.	Grade 2.	Grade 3.		Grade 1.	Grade 2.	Grade 3.
1945-46	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. and October..	1 9	1 7	1 5	7	2 4	2 2	2 0
November to Jan- uary 1946.....	1 11	1 9	1 7	4	2 3	2 1	1 11
February to May...	2 1	1 11	1 9	Nil	2 1	1 11	1 9
June.....	2 1	1 11	1 9	4	2 5	2 2	2 1
July to August.....	2 1	1 11	1 9	6	2 7	2 5	2 2

Rationing.

With the demand far exceeding the supply it was necessary, as in previous years, to ration creamery butter as follows:—

TABLE III.—*Percentage rationing on sales during period February and March. 1944.*

<i>Period 1945-6.</i>	<i>Percentage.</i>
September to 13 October.....	60%
14 October to 27 October.....	50%
28 October to 20 January.....	33½%
21 January to 3 March.....	50%
4 March to 10 March.....	60%
11 March to 18 August.....	75%
19 August to 31 August.....	60%

Cheese.

The quantity of cheese produced by factories in the Union during the year was disappointingly small, showing a shortfall of approximately 2 million pounds on that of the previous year.

Of the total production of just under 15 million pounds, slightly more than 73 per cent. consisted of Cheddar cheese, 25 per cent. of Gouda cheese, and rather less than 2 per cent. of other varieties.

From these figures it will be clear that the consumption of cheese per head of the population in the Union is exceptionally low. It is difficult to estimate what proportion of the non-Europeans can be included under consumers, but it is well known that many of our coloured and native population have long since learnt the value of cheese as an article of food. Had cheese been available, even at the comparatively high price of recent times, there is no doubt that very much larger quantities could have been disposed of.

With the greatly increased consumption of fresh milk and the serious shortage of milk for condensing purposes, there is little likelihood of the cheese-making industry developing to any considerable extent, unless factories are established in new areas suitable for the production of milk. For this, one should look in the first place to our large irrigation schemes and secondly to those parts of the Union which are too far from the large centres of population to be able to enter the fresh milk market.

It is well known that cheese-milk producers are not inclined to switch over to the production of cream for supply to butter factories, notwithstanding the fact that there is a very close relationship between the butterfat and cheese-milk prices as fixed by the Dairy Industry Control Board, and it must therefore not be expected that our creameries will receive additional support at the cost of the cheese-making industry. With the present shortage of butter, which it is hoped will be only temporary, but which may quite easily be of considerable duration, it would not be advisable to open up more cheese factories in what are now butter-producing areas, as this might further reduce the butter output. But it would appear that there is room for cheese factories in parts of the country where conditions are not suitable for sheep farming and where the farms are too small to make ranching possible or beef raising sufficiently remunerative to ensure the required income.

Little propaganda has been made to encourage the consumption of cheese, for the simple reason that there are no supplies available to satisfy the existing demand.

In cheese we have a food of a very high protein value in a most digestible and palatable form, containing all the milk-fat and also the lime, phosphates and vitamins so necessary to build up and maintain a healthy body.

The local consumption should be increased by at least one hundred per cent. Even with a little suitable propaganda and attractive packing and display by the retailers of this product, the industry will not be able to satisfy the demand for a long time to come. The fear that the market may be oversupplied during a really good season, seems to be unfounded.

During the period under review 11,143,507 lb. of Cheddar cheese was graded by officers of this Division before it reached the consumer. Of this quantity 9,592,428 lb. was passed as first grade, 1,435,113 lb. as second grade, 108,286½ lb. as third grade and 7,681½ lb. as undergrade. Expressed as percentages of the whole

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quantity, 86·08 per cent. was first grade, 12·88 per cent. second grade, 0·97 per cent. third grade and 0·07 per cent. below grade.

The following are the production figures for cheese over the past eight years, from the pre-war to the post-war period:—

TABLE IV.—*Total production of factory cheese (Union).*

Period.	lb.
Sept. to Aug.	
1938-39.....	14,115,960
1939-40.....	14,064,615
1940-41.....	13,839,957
1941-42.....	16,216,489
1942-43.....	16,614,103
1943-44.....	16,141,439
1944-45.....	16,828,924
1945-46.....	14,968,249

Cheese-milk Prices.

TABLE V.—*Prices paid to suppliers of cheese-milk.*

Period.	Purchased on Gallonage Basis.			Purchased on Butterfat Basis.		
	Basic price per gallon.	Premium.	Total.	Basic price per lb. butterfat.	Premium.	Total.
1945-46	d.	d.	d.	s. d.	d.	s. d.
Sept. to October...	9½	2½	12½	2 3	6½	2 9½
Nov. to January...	10½	2	12½	2 4½	5½	2 10
February to May...	10½	Nil	10½	2 5½	Nil	2 5½
May to June.....	10½	2	12½	2 5½	5½	2 11½
July to August....	10½	2½	13½	2 5½	6½	3 0½

That 86 per cent. of all the Cheddar cheese manufactured could be classified as first grade is satisfactory when it is borne in mind that much of this cheese had to be marketed before it had time to mature properly. This, of course, was due to the short supply which was experienced during a large part of the year.

As a result of the urgent demand for cheese, manufacturers have no doubt been tempted to accept milk which was not always of the desired quality and this must also be considered as one of the factors responsible for the degrading of approximately 14 per cent. of the output.

Gouda or sweetmilk cheese is either graded "first grade" or "ungraded", and of the 3,630,880 lb. graded, 2,510,216 lb. was passed as first grade, 1,117,712 lb. as ungraded or below first grade and 2,952 lb. classed as damaged (probably in transit). This gives a proportion of 69·1 per cent. first grade, 30·8 per cent. ungraded and 0·08 per cent. damaged.

These figures show that, despite the improvement in the quality of our Gouda cheese during recent years, there is still considerable leeway to be made up. What is cheering, however, is that the best Gouda made in the Union is very good indeed and compares most favourably with the best qualities produced anywhere else, including the country from which this variety of cheese derives its name.

There is a continual large demand for Roquefort and process cheese made in the Union. It is gratifying to be able to state that

the quality of these varieties of cheese has been most satisfactory throughout the year.

Since the quantity of cheese produced was not sufficient to meet the demand, rationing was necessary. As in the case of butter the retailers were rationed by the Dairy Industry Control Board, but the distribution of the available supplies to the consumers had to be entrusted to the retailers.

Rationing was based on the quantities of cheese issued by the Board's agents during February and March, 1944, when there were no restrictions on sales, and the percentages made available were as follows:—

TABLE VI.—*Percentages of issues during February and March, 1944.*

<i>Period.</i>	<i>Percentage.</i>
1945-46	
September to 3 December, 1945.....	60%
4 December to 17 March, 1946.....	40%
18 March to 12 May.....	60%
13 May to 31 August.....	70%

Pasteurizing of cheese-milk at our factories has become an almost general practice throughout the country. This has not occurred without considerable capital being laid out in modern plant. The results have shown, however, that this expenditure has been well worth while and improvement in the yield and quality of the product has been considerable.

Practically all cheese factories of any size have installed power whey separators and, despite the fact that there is only some 0.3 per cent. butterfat contained in whey, it has been found that this recovery is well worth while and creameries have welcomed this accession of whey cream.

A total quantity of 14,481,632 lb. of factory cheese was consumed during the year, while 96,670 lb. was supplied as ship's stores and to neighbouring territories. There was no importation of Cheddar or Gouda, but some 50 tons of process cheese entered the Union.

Condensed Milk and Milk Powder.

Due to the fact that practically all of our condensing and milk powder plants are surrounded by cheese factories and are also situated in areas from which the large cities draw their requirements of fresh milk, this section of the industry has had a particularly difficult time as regards the supply of milk.

Notwithstanding the fact that the price of condensing milk has been fixed at 1d. per gallon above the cheese-milk price, producers of the latter commodity do not appear to be inclined to divert their milk from their factories, which are in the majority of cases co-operative undertakings. Many of these co-operative cheese factories, however, temporarily discontinued cheese-making and disposed of the milk in the fluid milk market at more remunerative prices than could be obtained from the condensing factories.

With a lower production in the case of their regular supplies, due to the shortage in concentrates for feeding dairy cows, and with a considerable diversion of milk that should normally be available to the condensing plants, the manufacturers of condensed milk and whole-milk powder, not being able to obtain much or any support from the cheese factories or cheese-milk producers, are placed in a very serious position.

The production of these commodities has probably fallen more than that of any other branch of the dairy industry, and many regular consumers of condensed milk, who are not always in a position to obtain fresh milk in sufficient quantities, have had to go short.

The demand for fresh milk in the cities must be met even if industrial milk has to be diverted. Cheese factories which are in the position to pasteurize their milk and are situated within a reasonable distance from our large centres, can participate in the fluid milk market during times of low production, and will probably do so, to their financial benefit.

Condensing and dried milk factories, with considerable capital invested in buildings and plant cannot, however, afford to switch over.

It is perhaps unfortunate that our condensing factories should be situated in the areas that are best suited for the supply of fresh milk to cities, but this cannot be altered now.

Dairy farming has undoubtedly been severely handicapped by several unfavourable seasons, shortage of suitable concentrates, and other troubles. But these difficulties are not going to last for ever.

There is a good and assured market for the dairy farmer's product, not only for the present and the immediate future, but for very many years to come.

Milk and its products are of the utmost importance for the welfare and health of the nation. The importation of dairy products from other parts of the world may be possible, but this should be done only after our own production has been brought up to the economic maximum. As we are still far from that point, dairy farmers should "go all out" to increase production, not simply by increasing the number of cows in the herd but by improving the average standard of their cows. Even in the best dairying districts there is room for improvement.

Other Dairy Products and By-products.

Several specially prepared milk foods for babies and invalids are now being successfully manufactured in the Union. There would appear to be an increasing demand for these products, but the output has had to be restricted on account of the general shortage of milk experienced almost throughout the year.

Cheese whey and buttermilk have come to be highly valued by farmers as calf and pig feed.

The erection of a plant to manufacture buttermilk powder is now being considered by the owners of a large butter-making concern.

A plant for the recovery of milk sugar and albumen from whey is in operation at one of our larger cheese factories.

It is also interesting to note that a number of large cream producers who farm on the semi-ranching system, have been producing considerable quantities of crude casein from the separated milk which under their method of farming is not required for the feeding of calves.

Considerable quantities of this product are required for industrial purposes and the production of this crude casein, which does not involve much capital outlay, appears to be a very remunerative side-line to farmers who do not require the separated milk for feeding purposes.

Herd Recording.

The past few years have shown how extremely necessary it is that the production of milk should be materially increased. This cannot be done by simply increasing the milk-cow population.

Soil erosion and the urgent necessity for soil reclamation point to the fact that in many areas the number of stock carried should be reduced. It is therefore necessary that the production per cow be increased.

Many high-producing cows are to be found in the dairy herds in the Union but, unfortunately, too many low producers are also maintained, often at a considerable loss to the owner who is in many cases ignorant of this fact.

The true position can only be ascertained by the regular recording of all dairy cows, when strict selection, based on the productive capacity of individual cows and families, can be practised. The recording should be continuous over several lactation periods and preferably over the whole period that the cow remains in the dairy herd.

All dairy-farming countries appreciate this fact, and all have their schemes to suit their own particular conditions. During the past thirty years the Department of Agriculture has extended official milk-recording services to all farmers desirous of improving their dairy herds.

Unfortunately this work has had to be curtailed somewhat during the war period, when a number of the men employed under the official milk-recording scheme went on active military service, while it was not possible to fill such temporary vacancies.

For this reason some ground was lost and the scheme has not progressed as it should have done. The administrative work in connection with the milk recording has fallen behind very considerably.

Adverse climatic conditions, a serious general shortage of concentrates, labour difficulties and the outbreak of "lumpy skin" disease have undoubtedly been the cause of many farmers postponing entering their herds under the official Government milk-recording scheme. Others have probably refrained from applying for the services under the scheme as it was well known that the Department was not in a position to accept more than a few new applications, due to the difficulty, already referred to, of finding suitable young men to undertake the work.

Every dairy farmer should have all the cows in milk in the herd regularly recorded for milk and butterfat production, because without proper figures the farmer is to a large extent working in the dark.

It may not be possible for the Department to extend the services to every owner of milk cows in the Union, but this is no reason why such a small percentage of our herds should be tested.

In many areas, where the herds are comparatively small and the distance from farm to farm is not great, cow-testing associations could be formed and the work conducted under the auspices of a farmers' committee. This Division could assist in an advisory capacity. As the information wanted by the owner of non-registered cows is really for his own private use, official records are not required.

DAIRY PRODUCTION IN THE UNION.

In many cases a cheese factory, condensing factory or creamery is the centre of a dairying district and is conveniently situated to undertake the regular recording work on behalf of many of its suppliers.

Registered or stud-book cows will have to be tested under a Government scheme as the records are published and an official guarantee as to the accuracy of the particulars given is required.

At the end of August, 1946, there were 36 milk recorders on the staff of the Division, this number being eight short of the total number of posts approved.

A number of young men are expected to qualify for the post of milk recorder towards the end of 1946 and it is sincerely hoped that the vacancies will then be filled.

The recorders employed averaged 21 testing days each month, which can be considered a satisfactory working unit if the time taken in travelling between farms is taken into consideration. During August, 1946, altogether 3,256 registered cows and 5,920 grade cows were tested, making a total of 9,176 cows. Where the owners of registered cows requested it, the individual cows were also tested for the solids-not-fat content of the milk.

The herds tested during August, 1946, were distributed over the various areas as indicated in the following table:—

TABLE VII.—*Distribution of tested herds.*

AREA.	HERDS.			Cows.	
	Registered.	Grade.	Mixed.	Registered.	Grade.
Cape West.....	42	31	21	764	938
Cape East.....	75	10	14	822	278
Orange Free State.....	46	34	16	513	946
Natal.....	21	68	12	479	2432
Transvaal.....	27	16	23	678	1326
Union of South Africa.....	211	159	86	3256	5920

Although the testing of grade cows was continued and the milk-recording books on the farms reflecting the production of each cow were kept up to date, it was not possible to issue statements of record of performance, and no average production of grade herds was calculated.

During the year under review, 3,004 certificates of record of performance were issued in respect of registered cows which completed their official lactations. The average production of the various registered dairy breeds has been calculated by the Senior Dairy Officer concerned for each of the areas served.

The distribution of the various registered dairy breeds tested and their average production for 300 days during the period 1 September 1944 to 31 August 1945, are given in Tables VIII and IX.

Field Work and Inspection of Factories.

Dairy farmers and the manufacturers of dairy products are often faced with problems which have to be investigated "on the spot". The professional officers of the Division together with the officers of the Dairy Research Institute have been able to assist in solving many of the difficulties arising from time to time.

There can be no doubt that the quality of the butter and cheese manufactured in the Union has steadily improved, but it is also quite clear that there is still room for further improvement. The percentage of second grade cream delivered to the factories can be further reduced and the condition of the milk received at the cheese factories often leaves much to be desired.

For technical advice to be most effective it is necessary that qualified men study the conditions under which the milk is produced at the very source, that is, on the farm.

In pre-war days much work of this nature was undertaken by the dairy officers, but unfortunately facilities for travelling became rather difficult during the war and the field work had to be reduced to a minimum.

As previously referred to in this report, the Division was charged, in 1940, with the grading of all factory cheese and butter before distribution to retailers takes place. At that time it was not possible for the staff to be increased, with the result that the less urgent problems did not receive the attention they would otherwise have had.

More normal conditions are now returning and it is hoped that before long the Division will again be in a position to attend promptly to any request for assistance from farmers and manufacturers.

The following is a statement of duties performed by officers of the Division:—

Farms visited during the year in connection with milk recording	312
Farms visited for the purpose of rendering service	150
Visits of inspection made to creameries, including grading duties	1,316
Visits made to cheese factories for inspection and grading duties	1,135
Visits to other factories and cold stores and dairy-produce grading rooms	1,597
Lectures given at farmers' meetings	19
Judging at dairy shows	1
Butter samples tested for moisture content	170
Examinations in milk testing conducted	56
Examinations in cream testing	88
Examinations in cream grading	52
Examinations in cheese-making	46
Cans of cream (in transit) sampled and tested	997
Cans of cream, grading checked at creameries	8,463

Several officers of the Division also assisted in lecturing and demonstrating to students at agricultural colleges and agricultural trade schools.

DAIRY PRODUCTION IN THE UNION.

TABLE VIII.—Average Production of Registered Cows which completed a Lactation of 300 days during the Period 1 September 1944 to 31 August 1945.

AGE CLASSIFICATION.		2 YEARS.			JUNIOR 3.			JUNIOR 4.			SENIOR 4.			MATURE.		
Area where tested.		No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.
A.—AYRESHIRE.																
Cape Western.....	1	6,994	236.3	230.1	3	6,451	230.1	2	4,949	183.2	5	8,210	293.0	1	4,880	137.1
Cape Eastern.....	6	6,168	230.1	339.3	1	9,400	339.3	3	7,731	288.8	3	7,741	285.3	1	10,415	397.2
Natal.....	1	7,300	275.5	267.7	2	6,555	267.7	3	6,555	243.8	2	8,254	318.7	3	5,976	266.6
Transvaal.....	1	8,829	349.6	329.9	6	9,085	329.9	4	10,339	363.1	1	6,821	279.9	1	10,560	357.1
AVERAGE FOR UNION OF SOUTH AFRICA.....	9	6,681	249.1	295.3	12	7,968	295.3	10	7,865	283.0	11	7,964	294.4	6	7,297	281.8
B.—BROWN SWISS.																
Cape Eastern.....	—	10,053	406.1	—	2	8,017	307.4	—	—	—	1	7,527	310.4	2	11,026	429.8
Orange Free State.....	2	10,053	406.1	314.9	—	—	—	—	—	—	1	8,431	364.7	4	11,225	409.7
AVERAGE FOR UNION OF SOUTH AFRICA.....	2	10,053	406.1	314.9	2	8,017	307.4	—	—	—	2	7,979	337.5	6	11,159	416.4
C.—FRIESLANDS.																
Cape Western.....	58	8,608	312.2	347.7	29	9,688	347.7	28	10,090	362.1	37	9,758	347.7	34	11,196	403.5
Cape Eastern.....	159	9,467	358.9	363.5	66	9,671	363.5	60	11,348	417.0	63	11,751	441.0	54	12,611	477.7
Orange Free State.....	84	8,520	316.2	341.4	50	9,220	341.4	41	10,343	376.8	33	9,868	366.7	37	11,178	404.9
Natal.....	36	8,132	300.1	274.9	22	7,530	274.9	31	8,045	295.1	35	8,977	327.1	26	8,894	328.6
Transvaal.....	101	9,149	336.3	341.8	44	9,408	341.8	39	10,503	373.4	45	10,409	356.4	24	11,075	400.4
AVERAGE FOR UNION OF SOUTH AFRICA.....	438	8,988	334.5	342.3	211	9,248	342.3	202	10,255	374.5	213	10,398	383.3	175	11,270	415.1
D.—GUERNSEYS.																
Cape Western.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cape Eastern.....	10	7,110	345.8	494.3	2	10,531	494.3	3	7,220	310.4	1	8,877	310.8	3	6,499	308.4
Orange Free State.....	6	10,871	503.5	436.7	2	8,975	436.7	4	7,644	364.0	5	9,711	474.0	10	10,243	480.9
Transvaal.....	1	7,139	256.5	305.5	1	6,727	305.5	—	—	—	—	—	—	1	12,938	535.4
AVERAGE FOR UNION OF SOUTH AFRICA.....	17	8,439	398.0	433.5	5	9,156	433.5	7	7,462	341.1	6	9,489	446.8	15	9,492	440.9

TABLE IX.—Average Production of Registered Cows which completed a Lactation of 300 days during the Period 1 September 1944 to 31 August 1945.

AGE CLASSIFICATION.																			
2 YEARS.					JUNIOR 3.					JUNIOR 4.					SENIOR 4.				
Area where tested.					No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	No. of cows.	Lb. B.F. per cow.	Lb. milk per cow.	No. of cows.	Lb. B.F. per cow.	Lb. milk per cow.	No. of cows.	Lb. B.F. per cow.	Lb. milk per cow.	Lb. B.F. per cow.
E.—RED POLLS.																			
Cape Eastern.....	3	6,274	231.1	—	—	—	—	—	—	2	6,588	229.9	5	6,184	244.5	17	7,792	286.2	—
AVERAGE FOR UNION OF SOUTH AFRICA.....																			
F.—DAIRY SHORTHORNS.																			
Cape Eastern.....	32	5,961	242.0	19	8,216	338.7	7	6,444	252.9	8	8,935	346.0	2	6,667	253.6	34	8,094	318.5	—
Orange Free State.....	9	5,552	222.4	3	5,851	241.9	8	6,220	247.4	4	5,938	249.2	3	5,011	200.5	15	6,696	272.8	—
Natal.....	—	—	—	—	—	—	—	—	—	6	6,418	232.9	2	6,334	239.1	11	6,375	239.5	—
Transvaal.....	—	—	—	1	9,235	352.8	1	5,808	186.6	—	—	—	—	—	—	1	8,892	313.5	—
AVERAGE FOR UNION OF SOUTH AFRICA.....																			
	41	5,871	237.7	14	7,782	318.9	16	6,261	246.0	18	7,297	286.8	7	5,862	226.7	61	7,438	292.9	—
G.—JERSEYS.																			
Cape Western.....	35	6,433	324.1	13	7,528	371.1	14	8,056	400.3	14	7,058	360.9	8	8,358	434.8	9	9,277	440.1	65
Cape Eastern.....	45	5,750	298.9	21	6,441	332.5	30	6,411	347.6	13	7,092	374.1	16	6,291	347.9	13	7,251	366.9	75
Orange Free State.....	4	5,713	286.0	—	—	—	1	6,262	308.5	3	7,272	391.4	—	—	—	2	5,253	268.0	4
Natal.....	8	5,224	276.4	10	6,020	292.1	7	5,976	307.6	9	6,500	332.2	3	5,765	294.7	5	6,558	319.1	30
Transvaal.....	2	4,489	229.1	1	5,377	309.4	2	5,108	262.2	1	8,340	441.5	—	—	—	1	4,774	235.1	—
AVERAGE FOR UNION OF SOUTH AFRICA.....																			
	94	5,931	304.3	45	6,638	334.2	54	6,730	352.2	40	6,992	363.1	27	6,845	367.7	30	7,528	368.9	174
																			7,960
																			374.8

Research in Agricultural Problems.

Professor H. B. Davel, B.Sc., Director, Agricultural Research Institute, Pretoria.

THE Institute experienced a trying and difficult time during the year under review. Climatic conditions were extremely unfavourable. Although the total rainfall for the summer was only slightly below normal, its distribution was very irregular. By following sound farming methods, however, an average yield of 19 bags of maize per morgen was reaped over an area of 55 morgen which may, in the circumstances, be regarded as very satisfactory. Correspondingly good yields were obtained in respect of silage and fodder crops, with the exception of winter cereals and lucerne on dry-land, which failed completely owing to the very dry autumn and winter.

Practically all the cattle on the Experiment Farm contracted lumpy-skin disease, but fortunately it appeared in a comparatively mild form in most cases. Four pure-bred Frieslands (2 cows and 2 calves) died from the disease.

As far as the general farm and field investigational work is concerned, it may be stated that the war has left its aftermath of worn out implements and machinery, which affected operations considerably. Implements were unprocurable and could not be replaced, thereby greatly hampering essential work. In the field of research fair progress has been maintained.

In regard to the academic activities of the Faculty of Agriculture it is gratifying to report that the upward tendency in the number of students studying agriculture has been well maintained, and from 115 in 1944 and 126 in 1945 the enrolment has risen to 172 this year. Of this number 10 are following the newly instituted courses in soil and veld conservation. During the year two very successful short and refresher courses were conducted by the faculty, one in soil and veld conservation for officials of the Department of Native Affairs but also attended by a number of agricultural officers, and one on pig husbandry for practical farmers.

A New Department.—A new Department of Genetics was created, and Dr. J. D. J. Hofmeyr appointed as its head with the status of Senior Professional Officer, thereby relinquishing the Senior Lectureship in the Department of Agronomy. Mr. C. S. I. Ravenscroft was transferred from the department of Pasture Research to Genetics.

Students.

The following numbers of students are enrolled in the Faculty of Agriculture:—

B.Sc. Agric. 1st Year	71	
B.Sc. Agric. 2nd Year	21	
B.Sc. Agric. 3rd Year	24	
B.Sc. Agric. 4th Year	9	124
	—	—
Special Students	1	1
	—	—
B.Sc. Agric. Eng. 1st Year	13	
B.Sc. Agric. Eng. 2nd Year	4	
B.Sc. Agric. Eng. 3rd Year	1	
B.Sc. Agric. Eng. 4th Year	3	21
	—	—

M.Sc. (Agric.)	...	...	...	...	...	...	...	...	...	10	
D.Sc. (Agric.)	...	...	...	...	...	...	...	...	...	6	16
										<hr/>	
Soil and Veld Conservation 1st Year	...	...	...	...	...	...	...	...	...	6	
Soil and Veld Conservation 2nd Year	...	...	...	...	...	...	...	...	...	1	
Diploma in Soil and Veld Conservation 1st Year	...	...	...	...	...	...	...	...	...	3	10
										<hr/>	
TOTAL	...	...	...	...	...	...	...	...	...	172	

In addition, the Department of Entomology conducts courses for students registered in the Faculty of Science, as follows:—

D.Sc.	...	...	...	...	...	...	...	...	...	4	
M.Sc.	...	...	...	...	...	...	...	...	...	1	
B.Sc.	...	...	...	...	...	...	...	...	...	22	
										<hr/>	
TOTAL	...	...	...	...	...	...	...	...	...	27	

The following degrees were awarded in 1946:—

M.Sc.(Agric.)	...	...	...	...	...	...	...	...	...	3	
B.Sc.(Agric.)	...	...	...	...	...	...	...	...	...	13	
B.Sc.(Agric. Eng.)	...	...	...	...	...	...	...	...	...	1	
										<hr/>	
TOTAL	...	...	...	...	...	...	...	...	...	17	

Research.

The research and investigational work of the Institute covers a wide field and embraces a great number and variety of experiments, all of which are of fundamental importance to our whole agricultural structure. Unfortunately it is not possible within the compass of this brief report to refer to all of these experiments. Only the main aspects of the work and such results as may be of topical interest are summarized below.

Department of Agronomy.

The research work of this department consists mostly of long-term crop and grassland experiments, with run-off and erosion studies forming an integral part of the whole programme.

The *rotation experiments*, started in 1938-39 on the utilization of crops and rotation effect combined, continued to show that in a three-course rotation of babala and two maize crops the latter were not materially affected when the babala was used as ensilage or a grazing crop, but when ploughed under as a green manure crop the maize yields were markedly increased. With Rhodes grass for three years, followed by maize, the yields of the latter were as good as with maize grown in mono-culture. With maize following cowpeas the yields of the former were significantly better than after Rhodes grass. The yields of maize following cowpeas as a green manure were greatly improved over the yields of maize in mono-culture and the results were almost as good if the cowpeas were harvested for hay instead of being ploughed in.

The studies on *wide espacement of maize* in 6-foot rows compared with 54 in. and 36 in. rows, but with an inter-row spacing adjusted to give the same number of plants per morgen, showed that a lower yield was obtained when the rows were 6 feet apart. These results differed from those previously obtained. Previously no material difference in yield was observed with varying row distances, provided the number of maize plants per morgen remained constant.

The *Unit Experiment* on land utilization continued to furnish results not differing materially from those previously reported. The

milk production was slightly lower than the year before, but the carrying capacity in terms of cows was higher, this being just over 10 cows per 30 acres of arable land.

The *field trials* with crops under irrigation gave results similar to those of previous seasons. With maize under irrigation, 7 tons of kraal manure per morgen raised the production by 18½ bags, 800 pounds of superphosphate per morgen increased the yield by 7½ bags and 400 pounds of ammonium sulphate accounted for an increase of 4 bags per morgen. The residual effect of these fertilizers on peas following on the maize was also marked, being 4½ bags after superphosphate and 3½ bags after kraal manure. The ammonium sulphate resulted in a decrease in pea yields of two bags per morgen. This was no doubt due to the gradual increase in soil acidity brought about by the heavy applications of ammonium sulphate. Muriate of potash had no material effect either on maize or on peas.

In the *wheat-cowpeas series* the kraal manure raised the yield of wheat grain by 12 bags per morgen, while superphosphate increased the yield by 11 bags per morgen, but neither ammonium sulphate nor potash had any material effect. With the follow-up crop of cowpeas, superphosphate increased the green weight of cowpeas by 6 tons, while kraal manure raised it by 14 tons, but ammonium sulphate decreased the yield by 2½ tons per morgen, due again no doubt to the acidity factor. Potash showed a slight beneficial effect on the cowpeas.

In general it would appear that kraal manure and superphosphate in relatively large dressings are required for irrigated crops. Ammonium sulphate improves maize yields, but has no effect on wheat and is definitely prejudicial to peas and cowpeas. In view of the interesting responses obtained, the results are presented below in summarized form.

TABLE I.—*Irrigation experiments 1945-46. Yield increases due to fertilizers and irrigation.*

Treatments.	SERIES A.		SERIES B.	
	Maize (Grain).	Peas (Grain).	Wheat (Grain).	Cowpeas (Wet produce).
	Bags per morgen.	Bags per morgen.	Bags per morgen.	Tons per morgen.
Irrigation levels*.....	0.92	4.47	4.77	0.76
Kraal manure†.....	18.46	3.47	11.99	13.98
Superphosphate†.....	7.49	4.63	11.32	6.00
Ammonium sulphate†...	4.22	-2.03	1.58	-2.58
Muriate of potash†.....	0.64	0.06	0.48	1.58

* Irrigation different only in case of winter crops, i.e. wheat, peas.

† Fertilizers are applied only to maize and wheat; peas and cowpeas rely on residual effect.

The liming experiments in conjunction with fertilizers for crops grown under irrigation showed that lime was without effect on maize, but improved the yields of peas to the extent of about 5 bags per morgen. A slight overall benefit was noticed with wheat, but not with cowpeas.

The data are summarized below:—

TABLE II.—*Irrigation experiments 1945-46: Crop yields after lime had been applied to wheat and peas during 1942 and 1943. Yields are given in bags of grain or tons of hay per morgen.*

Treatments.	SERIES A.		SERIES B.	
	Maize (Grain). b.p.m.	Peas (Grain). b.p.m.	Wheat (Grain). b.p.m.	Cowpeas (Wet produce). t.p.m.
No treatment.....	20·1	6·9	9·7	23·7
Inorganics.....	35·9	9·8	27·1	31·0
Manure.....	35·9	10·3	19·4	35·5
Manure and inorganics.....	41·5	13·6	33·0	36·7
Mean of treatment without lime..	33·3	10·2	22·3	31·7
Lime.....	19·9	11·4	13·6	19·9
Lime and inorganics.....	36·0	16·7	29·7	30·4
Lime and manure.....	35·6	14·7	23·9	32·7
Lime and manure and inorganics.	44·0	18·3	35·5	37·8
Mean of treatment with lime.....	33·9	15·3	25·7	30·2

The studies on the utilization of wheat straw and compost made from wheat straw compared with kraal manure, soya bean residues and mineral fertilizers were continued with modifications. The organic matter applications were adjusted on a basis of the same equivalent of combustible material as is contained in a three-ton dressing of wheat straw. The results for the past season are given in Table III.

TABLE III.—*Compost experiment, 1945-46.*

Source of organic matter: Equivalents of combustible material in 3 tons wheat straw.	Wheat (Grain). Bags per Morgen.	Cowpeas (Wet produce). Tons per Morgen.
Wheat straw.....	9·73	19·20
Compost (wheat straw and manure).....	16·95	24·65
Compost (wheat straw and minerals).....	19·72	23·26
Kraal manure.....	26·71	23·03
Soya bean residues.....	16·65	23·01
Mineral Fertilizers.....	10·67	20·07

The results in Table III show that even when the organic matter is kept at a constant level, the resulting yields differ considerably. The differences are presumably due to the different amounts of *nutrients* contributed by the organic manures rather than the organic matter *per se*. The effect of the compost and crop residues is such as to place these midway between the straw and the kraal manure as fertilizers.

The dryland-lucerne experiments showed that good yields of hay are possible under dryland conditions. The results suggest not only that dryland lucerne is a useful pasture and hay crop, but also that

RESEARCH IN AGRICULTURAL PROBLEMS.

its persistency is prolonged, good yields still being obtained four years after establishment. The yields of air-dry hay per morgen were successively about $3\frac{1}{2}$ tons, 9 tons, $4\frac{1}{2}$ tons and $4\frac{1}{2}$ tons for the past four seasons. No significant differences were noted for various rates of seeding tested, either broadcast or in rows. It is proposed to establish a larger patch of lucerne this year and to study its effect as a ley in rotation with summer crops.

Long-term Fertilizer Experiments with Grass.—A number of experiments on the effects of fertilizers on established pastures and veld was continued. These were (a) fertilization of a Rhodes and Paspalum mixture, (b) fertilization of veld, and (c) different kinds and amounts of fertilizers for Rhodes grass and Paspalum in pure stands.

The experiments with the mixed pasture of Rhodes grass and Paspalum showed that the pasture did not react materially to dressings of superphosphate, but markedly so to heavy dressings of ammonium sulphate. The dressings of superphosphate used were 0, 600 and 1,200 pounds per morgen in all possible combinations with 0, 500, 1,000 and 2,000 pounds of ammonium sulphate per morgen. Where no nitrogenous fertilizer was used, the Rhodes grass predominates, but with high dressings of ammonium sulphate the Rhodes grass has been almost entirely replaced by Paspalum.

In a series of experiments along similar lines, but with pure stands of Rhodes grass and Paspalum, respectively, still higher dressings of nitrogen, derived from ammonium sulphate, nitrate of soda and ammonium nitrate, were tested. On the Rhodes grass series the yields of hay were as follows:—

TABLE IV.—*Fertilizers and Rhodes grass.*

Pounds applied per morgen.†	HAY YIELDS IN TONS PER MORGEN.			
	Ammonium sulphate.	Sodium nitrate.	Ammonium nitrate.	Averages.
0.....	(4)* 3·51	(4) 4·34	(4) 3·97	(12) 3·94
1,000.....	(4) 6·41	(4) 5·66	(4) 5·45	(12) 5·84
2,000.....	(4) 6·71	(4) 6·33	(4) 6·51	(12) 6·52
3,000.....	(4) 7·02	(4) 7·72	(4) 7·04	(12) 7·26
4,000.....	(4) 6·95	(4) 7·54	(4) 6·82	(12) 7·10
Averages.....	(20) 6·12	(20) 6·32	(20) 5·96	

* Figures in brackets refer to number of plots averaged.

† Equivalents in terms of nitrogen furnished by ammonium sulphate dressings :

Minimum differences significant at $P = 0.05$. :—

Comparison of averages of 4 plots = 1·13 tons per morgen.

Comparison of averages of 12 plots = 0·65 tons per morgen.

Comparison of averages of 20 plots = 0·51 tons per morgen.

The results show that Rhodes grass responds well to heavy dressings of nitrogenous fertilizers but that not much advantage is obtained after an application of about 2,000 pounds per morgen. There was no significant difference in the three sources of nitrogen judged on one year's results, but differences due to changes in soil reaction may show up later.

The Paspalum series were not sufficiently far advanced to apply the differential fertilizer treatments which will only commence in 1946-47.

The use of heavy dressings of fertilizer to veld showed on the average a slight response to superphosphate, the hay yields being 3.82, 5.40 and 5.38 tons per morgen with 0, 600 and 1,200 pound applications of superphosphate (i.e. in addition to the dressings of ammonium sulphate used). The overall response to ammonium sulphate was 1.01, 2.42, 3.44, 3.60, 4.12 tons per morgen, respectively, for 0, 1,000, 2,000, 3,000 and 4,000 pounds per morgen of ammonium sulphate. The response to superphosphate is only material with adequate amounts of ammonium sulphate, and apparently there is a decided quantitative relationship between increments of ammonium sulphate and yield. With the large dressings of nitrogen the botanical composition was markedly affected even in a single season. Most of the veld grasses have been injured, except *Eragrostis* spp. which now appears to have become dominant. The results cover only a single season so that it is still too soon to draw very definite conclusions. The trends are, however, not without interest.

In all the experiments with fertilization of grass the following features predominate:—

- (1) Superphosphate becomes important only when the nitrogen status of the soil is raised to a high level.
- (2) Grass crops—unlike maize—respond well to nitrogenous fertilizers, but in order to be effective *large* dressings are required.
- (3) The use of ammonium sulphate affects the succession in a mixed pasture or veld very markedly.
- (4) The economics of grass fertilization requires thorough investigation.

Grassland Experiments.—The grassland research programme was continued as a matter of routine and the results are reported in detail in the annual reports issued on this section.

Department of Agricultural Chemistry.

The accumulated data of the lysimeter experiments on the Experiment Farm have now been collated and written up for publication. These experiments were started in 1930 when the Faculty of Agriculture initiated a series of investigations on the general problem of moisture utilization and dissipation, this being the first serious attempt in South Africa to approach and investigate the drought and erosion problem scientifically. Unfortunately its funds and facilities did not allow the Faculty to carry out these investigations on a more comprehensive scale.

Briefly the results obtained indicate that only 11.7 per cent. of rain percolates to a depth of 5 feet on bare soil on which the surface is kept loose and permeable by frequent cultivation; under a fertilized maize crop the percolation amounted to only 3 per cent. of the rainfall, and where manure was applied it fell to 2.2 per cent. as a result of the higher yield produced by the manure.

In a latter series of lysimeters under a natural grass cover and so constructed that no run-off takes place, the percolation to a depth of 4 feet amounted to only 2.08 per cent.; at 3 feet 4.5 per cent. and at 2 feet 6.8 per cent. of the rainfall leached through.

These results emphasize the power of the plant to dry out the soil and it makes little difference whether the plants are widely spaced as in the case of maize, or closely like grass. In respect of the

summer-rainfall areas it appears, therefore, that only insignificant quantities of rainwater will penetrate to the underground reservoirs while the crops are growing actively. Only rain falling in the late summer or winter, when the plants are dormant or their growth has abated, has a chance of reaching these reservoirs.

Department of Animal Husbandry.

Livestock.

(1) *Friesland herd*.—The progeny of the junior herd sire, Brakfontein de Beste Melkman, are very promising. A number of daughters of the senior herd sire, Brakfontein Bles Jetsches Bert, are now in milk and the production records obtained thus far are very satisfactory. In order to maintain and improve the standard of the herd it will be essential to import a first class sire from Holland. In addition it would be advisable to import one or two females to strengthen the breeding value of the herd. Several promising young bulls have been transferred to other government institutions during the past year.

(2) *Africander herd*.—Further progress has been made in the breeding of the Africander herd. The junior herd sire, Zwawelfontein Unie, has developed into an outstanding young bull. His first crop of calves is expected towards the end of this year. A number of young Africander bulls were transferred to other institutions.

(3) *Pigs*.—The Institution has been fortunate in acquiring one Large White boar and two Large White sows from the famous Histon stud in Great Britain. A large number of stud boars and gilts have been transferred to other institutions or sold to farmers. Several important improvements have been made to the pig plant. A new weighing bridge has been erected and the construction of a number of pig sties is in progress.

Research.

The research programme in connection with the determination of the breeding value of Friesland bulls in South Africa was continued. The results indicate:—

- (a) The need for the introduction of new blood into the Friesland herds of South Africa by importing a number of sires from Friesland.
- (b) An urgent need for improving the methods of food conservation, feeding and management in a large number of dairy herds in South Africa. The results of the study on the breeding value of a number of bulls were published in *Farming in South Africa*.

The Influence of Environmental Factors upon the Quantitative and Qualitative Production of Milk.—From the mass of data available in the official milk records which have been obtained under the Government Milk Testing Scheme, an analysis has been made to ascertain:—

- (i) The influence of the time of calving upon the composition and total milk yield of cows during the various stages of their lactation, and
- (ii) the influence of the variations encountered in the environmental conditions of different areas in South Africa upon the seasonal production of dairy cows and the composition of the milk.

The data for the following areas have been analysed:—

- (1) Western Cape Province.
- (2) Oudtshoorn Irrigation area.
- (3) Eastern Cape Province, Bedford and Adelaide.
- (4) North-eastern Karoo, Middelburg, Steynsburg and Colesberg.
- (5) North-eastern sour grassveld area of the Eastern Cape Province.
- (6) Eastern Orange Free State.
- (7) Western Transvaal.
- (8) Central Transvaal city milk producing area.
- (9) Natal.

The analyses show:—

- (1) Striking variations in the shape of the lactation curves of cows calving during the same month in different parts of the Union.
- (2) Marked variations in the shape of the lactation curves and the total milk yield of cows calving during different seasons of the year.
- (3) Similar differences in the composition of the milk during various seasons of the year.

The results further indicate that environmental and seasonal fluctuations have an important influence upon the yield and composition of milk and that the feeding and management in most of the dairy herds will have to be improved.

Zoning of Natural Farming Regions of South Africa.—A preliminary survey of the natural farming regions of South Africa has been completed and mapped. The animal production of these regions has been carefully studied and it appears that there is an urgent need for adjusting animal and crop production in harmony with the natural environmental controls. Adjustment of the farming systems and practices is essential in order to increase the level of food production and to prevent further exploitation of the veld and soil resulting in erosion.

Pig Experiments.—A study of the factors influencing the cost of production of breeding pigs shows that fertility and the milk-giving qualities of sows have an important bearing on the cost of production.

The value of creep feeding in the production of weaners is being studied.

Sheep Experiments.—Work in connection with the development of a non-woolled mutton breed for the semi-arid areas from the Dorset Horn-Persian half-bred or three-quarter-bred is being continued. The results now extend to the third generation of the "Dorsian" and show promise of being crowned with success.

Some mutton Merino ewes in lamb to a mutton Merino ram have been presented to the Institution by Messrs. Frasers, Ltd. The suitability of this breed as a mutton type of woolled sheep for the grassveld areas of higher rainfall is being investigated.

The Nutritional and Climatological Project using different types of sheep has been continued. The results obtained in the first year indicate that:—

- (1) The feed requirements for the maintenance of body weight and normal wool growth are in descending order for the following: Merino, Dorset Horn and Merino half-bred, Dorset Horn and Persian half-bred and Blackhead Persian.
- (2) There was no difference in the efficiency of the different types of sheep in digesting their feed.

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- (3) Over a period of a year, keeping the sheep in the sun or shade showed no difference in their feed requirements, efficiency of digestion or rectal temperatures, except that in the early afternoon the sheep kept in the sun had higher temperatures than those kept in the shade.
- (4) It would appear that some of the nutrients may be better digested in winter than in the summer.

Department of Entomology.

This Department was formerly responsible for all the locust research work, but has now handed most of the work over to the Chief Locust Officer, and more time is being devoted to investigations in the taxonomy of Thysanoptera (thrips) and ants. Intensive study is also being devoted to the anatomy and biology of termites.

Department of Biochemistry.

Studies on Intermittent Inanition in the Feeding of Poultry.

In last year's report the plan of this study, as well as the results obtained with the cockerels, was briefly outlined. It was then stated that inanition exerted no appreciable effect on the growth and tissue composition of the various groups of fowls studied.

During the past year, the work with the pullets was concluded. The rations and the method of feeding were identical with those used with the cockerels, but in this case growth, mortality and egg-production served as the criteria.

The results show that the pullets were more susceptible to the treatments applied than the cockerels, as the growth and egg-production of the underfed groups were much lower than the growth and production of the control group. The average increase in weight and egg-production of the control group, over a period of one year, was 1,414 grammes and 127 eggs, respectively, whereas the corresponding averages for the two underfed groups amounted to 1,360 grammes and 81 eggs. The percentage mortality, out of 30 birds in each group, was 20 per cent. for the control and 27 per cent. (average) for the underfed groups.

According to expectation, the underfed animals utilized their food more efficiently than the controls. For instance, in order to gain the same amount in weight, the underfed groups consumed on the average 18 per cent. less food than the control group. This saving in food consumption did not, however, compensate for the lower egg-production.

Trituration of Calcium Phosphate in Relation to the Utilization of Calcium and Phosphorus.

The advocates of the so-called Schuessler or Biochemic Remedies such as Calcarea Phosphorica and others maintain that the mineral elements in these preparations are utilized to a greater extent than in the corresponding laboratory salts. Their claim is based on the "infinitesimal reduction" and dilution of the mineral substances which, according to them, permits ready assimilation and diffusion of the mineral salts into the cells and tissues of the body, thus enhancing their therapeutic effectiveness to a remarkable extent.

All the Biochemic Remedies contain lactose as a diluent. It is well known that lactose promotes the absorption of calcium and phosphorus by virtue of a greater acidity in the intestinal tract brought about by the bacterial fermentation of lactose to lactic acid. The question now arises as to whether the better utilization of the mineral elements in the Biochemic Remedies is due solely to the presence of the lactose or whether the trituration and comminution also play a part.

In order to gain more information on this point, three groups of young rats were given the following supplements to an ordinary synthetic basal ration:—

Group I received the ordinary tricalcium phosphate, Group II received tricalcium phosphate in the form of *Calcarea Phosphorica* (a concentrated form of calcium phosphate, specially manufactured for this experiment), and Group III received ordinary tricalcium phosphate and lactose. The calcium and phosphorus contents of all the rations were the same but slightly below optimum for normal growth, the lactose contents (*viz.* 35 per cent.) of rations II and III were also equalized.

The rats were kept in individual cages and all the animals received the same amount of food daily; that is, their calcium and phosphorus intakes were the same. After five weeks the rats were killed and their femurs removed. Ash determinations were then made on the individual moisture and fat-free femurs.

The results showed that the ash content of the femurs of Group II was the highest, that of Group I the lowest, while that of Group III fell in between the two. It is therefore concluded that the utilization of calcium and phosphorus is not only promoted by the presence of lactose but also by the “infinitesimal reduction” of the calcium phosphate.

In a balance experiment with rats on the same rations, a study is being made of the percentage retention of calcium and phosphorus at monthly intervals of the animal's life.

The Relation between Calcium Intake and Uric Acid Metabolism in Laying Hens.

As laying birds require large amounts of calcium for egg-shell formation, the general practice in the past has been to feed calcium-rich rations to the laying stock. The feeding of these rations, however, resulted in high mortality which dropped considerably when the calcium content was lowered.

It is surmised, therefore, that the system of the animal eventually collapses under the strain of metabolizing such large amounts of calcium. Under the circumstances the kidneys through which the excess calcium is filtered, would be among the first organs to show signs of stress. Furthermore, if this reasoning is correct, one would expect that an impaired renal function would give rise to an accumulation of uric acid in the blood, as all the nitrogenous waste products in birds are converted to uric acid prior to their excretion through the kidneys.

In order to test this theory, one group of hens is being fed a “normal” calcium ration (1.5 per cent. Ca.), whereas a second group is receiving a high calcium ration (3 per cent. Ca.). At two-monthly intervals balance determinations are made of calcium, phosphorus and uric acid on certain birds of each group. A record is also kept of the uric acid content of the blood. No conclusions can as yet be drawn as the experiment has not progressed far enough.

Department of Dairying.

Investigation of the Composition of South African Factory Cheese.

Period March 1945 to August 1946.

During the past 17 months, 303 cheese samples have been analysed. The samples were received from 15 different cheese factories which are more or less evenly distributed over the Union.

Thus far 214 Cheddar and 89 Gouda cheese have been analysed. The following is the average composition of the samples analysed:—

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I. Cheddar Cheese.

Analysis of 214 samples, with average age of 105 days, supplied by 11 factories.

Constituent.	COMPOSITION.	
	Wet basis percentage.	Dry basis percentage.
Moisture.....	32.377	0
Total solids.....	67.623	100
Ash.....	3.728	5.516
Fat.....	36.117	53.435
Proteins.....	25.662	38.059
Chlorides (Cl.).....	0.997	1.491
Phosphorus (P.).....	0.558	0.827
Calcium (Ca.).....	0.736	1.093

II. Gouda Cheese.

Analysis of 89 samples, with average age of 77 days, supplied by 4 factories.

Constituent.	AVERAGE COMPOSITION.	
	Wet basis percentage.	Dry basis percentage.
Moisture.....	34.430	0
Total solids.....	65.570	100
Ash.....	4.051	6.203
Fat.....	34.733	52.967
Proteins.....	24.837	37.696
Chlorides (Cl.).....	1.067	1.641
Phosphorus (P.).....	0.568	0.865
Calcium (Ca.).....	0.771	1.175

From the foregoing analyses it is evident that on a dry basis there is comparatively little difference in composition of Cheddar and Gouda cheese. This is also the position when the cheese is waxed. There is, however, a marked difference in the moisture content of waxed and unwaxed cheese in both types, as shown by the following figures:—

Type of Cheese.	Average percentage of moisture.	
	Waxed.	Unwaxed.
Gouda.....	37.203	31.656
Cheddar.....	34.182	30.572

From the point of view of yield per 1,000 lb. of milk this difference may throw some light on the low average yield per unit weight of milk obtained in our factories.

The legal standard for the fat content of cheese is 45 per cent. on a dry basis. The lowest percentage of fat on a dry basis found in

the cheese analysed in this investigation was 49 per cent. The investigation is to continue until March 1947 to determine any seasonal and local variations.

The Composition of Milk Supplied by Producers to the City Distributive Trade.

During the twelve-month period 14 August 1944 to 16 July 1945, altogether 1,608 samples of milk were taken of the incoming supplies received from all producers at a Pretoria milk plant. The samples were taken every fortnight and it is estimated that they represented the bulk milk of about 3,800 cows. The mean composition of all the milk samples was:—

	<i>Per cent.</i>
Total Solids	12.12
Fat	3.51
Solids-not-fat	8.61
Ash	0.737
Protein	3.19
Lactose	4.69

Except for ash, the mean composition of the milk, especially in solids-not-fat and protein, is poorer than the composition given for milk in Great Britain and the United States of America.

The highest monthly averages for fat were found in those months in which the lowest mean air temperatures occurred (i.e. in winter) and *vice versa*. Variations in rainfall did not appear to affect the fat content of milk.

In the case of the solids-not-fat content, however, air temperatures do not appear to have any influence. The highest monthly average for solids-not-fat was found in November 1944, the month in which the first heavy seasonal rains occurred. The lowest mean tests for solids-not-fat were found to occur in the dry months of July, August and September. The solids-not-fat constituents, which were mainly affected by this trend, were the ash and lactose, although the protein was also found to be low in the late dry winter months.

A comparison of the variations in the composition of milk, as revealed in this study with research work conducted on the seasonal variation in the nutritive value of pastures, showed that there is apparently a relationship between the feeding value of veld and the mean solids-not-fat content of milk. Less than 8 per cent. of the supplies failed to test 8.5 per cent. solids-not-fat during November.

Over a period of one year there appeared to be little difference in the composition of morning or evening milk, the evening milk being slightly higher in fat (± 0.14 per cent.) and the morning milk slightly higher in solids-not-fat (± 0.11 per cent.).

More than 25 per cent. of the 46 dairy farmers whose supplies formed the subject of this study, produced milk with a mean solids-not-fat content of less than 8.5 per cent. for the whole period. The means for protein were also unsatisfactory as 58 per cent. of the producers sent in milk which averaged less than 3.2 per cent. in respect of this constituent.

From a study of the results of bacterial tests made by the S.A. Veterinary Corps on the morning milk received at the plant, it appears that mastitis may be an important contributing cause of the low solids-not-fat content of much of the supplies.

Added water was found in the supplies of only two producers. From the abnormal composition of the milk received from two producers it was concluded that they partly skimmed their milk.

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The fat content was below standard in 2.8 per cent. of the milk sampled. The solids-not-fat was deficient in 35.4 per cent. of the supplies, 33 per cent. testing between 8.0 per cent. and 8.5 per cent. solids-not-fat. Twenty-nine producers supplied milk which was never found to be deficient in fat.

Department of Genetics and Plant Breeding.

Vegetable breeding.—The selection and breeding of onions was started in 1943 and attention was focussed especially on a local variety grown in the Uniondale district. Through selection this variety has been developed to a high degree of purity. It proved to be outstanding as regards yield, eating and keeping qualities. Some of the best bulbs were selected and planted for seed production with the object of conducting further tests on a more comprehensive scale.

Maize breeding.—A cross between the yellow variety Hotnot and Potchefstroom Pearl was made in 1943. The progeny was back-crossed through 5 generations to the latter by growing two generations per year. The result has been a type showing great similarity to Potchefstroom Pearl, with the exception of the colour of the seed which is yellow. Crosses were also made between Sahara and Potchefstroom Pearl, Robyn and Potchefstroom Pearl, etc.

Progress has been made in the breeding of maize for canning purposes.

Broom sorghums.—Selection work is in progress with the object of producing three types of fibre, namely, coarse, medium and fine.

Department of Poultry Husbandry.

Nutritional experiments had to be limited during the past year on account of the fact that certain feeds were unobtainable. In spite of this difficulty, experiments were conducted to determine the rate of growth in chicks on all-mash rations and the percentage mortality was slightly higher on the high calcium than on the low calcium rations.

The cockerels were removed from the various experimental groups at 16 weeks of age, while the pullets were retained for egg-production studies. The results obtained indicate fairly definitely that maximum levels of calcium should not be included in laying mashes if scratch grain is rationed. It is recommended that a laying mash should contain approximately 2 to 2.2 per cent. of calcium and 1 to 1.1 per cent. of phosphorus. If maximum levels of calcium are fed in mashes to pullets from 8 weeks of age, it is found that they consume more mash than grain and that various abnormalities occur, resulting in high mortality.

The breeding of a sex-linked fowl, that is an auto- or self-sexing breed, has progressed to the stage where the sexes can be identified at day-old by their down colour, the males being lighter in colour than the females. Steps are now being taken to improve the quality of this new breed.

Department of Horticulture.

During the past year the normal routine in respect of the research activities of the Citrus Research Station at Addo was continued. The main experiments in progress at present include (a) irrigation demonstration trials in several citrus orchards, (b) fertilizer trials, the main experiment being carried out on Valencia orange trees at Sunland Farms, where outstanding responses have been obtained from the application of nitrogenous fertilizers, and (c) a study of the decline

of grapefruit trees (so-called "stem pitting and small counts") in support the Institute is deeply indebted to the Company. A separate report on the research work conducted in the Valley is issued annually and circulated amongst the growers of this area.

The Research Station receives an annual grant of £600 from the Sunday's River Citrus Co-operative Company. For this financial support the Institute is deeply indebted to the Company. A separate report on the research work conducted in the Valley is issued annually and circulated amongst the growers of this area.

Soil fertility and nutritional studies on citrus.—Apart from a few soil samples obtained from the Tzaneen area, no further soil studies were undertaken during the past year. It is felt that sufficient data are now available for satisfactory fertilizer programmes to be laid down for the various citrus areas in South Africa. Further studies are necessary, however, in order to aid in the solution of specific nutritional problems.

Pot experiments are being conducted in which young Valencia orange trees are grown in soil from White River, the main object being to throw light on the so-called "greening" disease affecting citrus fruit in this area. Thus far no definite results can be reported.

During the past year a nutritional trial using the sand culture technique was started in order to study the rôle played by magnesium in citrus nutrition. Apart from the general problem of magnesium deficiency which occurs in several parts of the Union, there is a possibility of excessive supplies of this element being present in other areas, such as Rustenburg.

Sour-orange rootstock problem.—In view of the possibility that the incompatibility between the sour-orange rootstock and certain scion varieties of citrus may be of a pathological nature (*cf.* 1945 report), it was decided to conduct further studies on this problem in co-operation with the Division of Botany and Plant Pathology. If a virus should be responsible for this peculiar behaviour of the sour-orange rootstock, then it might be possible to eliminate infection by raising rootstock and scion material in a glass-house free from insects. The necessary glass-house facilities are being provided by the Division of Botany and Plant Pathology, and steps have been taken to obtain the necessary seedling material of various species of citrus. This type of work is necessarily of a long-term nature so that definite results are not expected for at least four or five years.

Department of Veterinary Science.

The research activities of this Department include studies on the antigenic values of salmonellas, paratyphoid in calves and abortion in mares caused by nutritional disturbances as well as infection.

The chemico-therapeutical treatment of mastitis had unfortunately to be suspended due to apparatus and chemicals being unobtainable.

The determinations on the extent to which city milk supplies carry tubercular infection are being continued.

Insect Pests and Their Control.

T. J. Naude, M.Sc., Ph.D., Chief, Division of Entomology.

ALTHOUGH the headquarters of the Division are at Pretoria where some of the research work is also conducted, the main centres of investigational activity are scattered throughout the country, namely at the four Agricultural Colleges, at Nelspruit Research Station, at Rustenburg, Port Elizabeth, Capetown, Uitenhage, Fort Beaufort and Bethlehem, whilst on many occasions work is undertaken at any convenient centre where suitable conditions are encountered. Bethlehem is a new station, designed to serve the interests of the eastern Orange Free State in particular, and a new unit has also been established in Pretoria to give special and full-time attention to insecticide questions.

Plant Regulatory Service.

Amongst the main items handled by the Plant Regulatory Board during the past year may be mentioned bacterial canker of tomato, bacterial ring-rot of potato, potato blight, citrus black spot, the desirability of registering carnation nurseries, black scab or warty disease of potatoes, the importation of stone fruits from America and the importation of citrus peel. The regulations on the treatment of citrus trees by nurserymen has been amended in order to evade the danger attendant on the compulsory fumigation of citrus trees after spraying with Bordeaux mixture. Additions have been made to the number of sugar-cane varieties permitted for distribution in the Union. The removal of potato and other root crops from the townships of Charlestown, Volksrust and Wakkerstroom has been prohibited by regulation in order to combat the spread of warty disease, *Synchytrium endobioticum*. Regulations have been promulgated under the Veld and Forest Conservation Act to combat the spread of certain insect pests in timber. The number of permits issued during the year for the introduction of plants and plant products total 488, whilst 134 and 48 respectively were issued in respect of the introduction of bees-wax and seed potatoes. Plant export certificates total 1209. Owing to the urgent demand for cotton, cotton seed and oil, some relaxation has been granted in respect of import conditions for these products. Nursery registration has reached a record total of 636, the number of trees in these nurseries reaching the following totals: Mixed trees and plants, 30,342,148; citrus stocks, 573,300; deciduous stocks, 2,753,100; and vines, 7,653,000. Nursery quarantines imposed total five, four of which were lifted on re-inspection. The revenue totalled £1,894.

Biological Control of Cactus.

The main feature of the year under review is the encouragingly large acreage of prickly pear felled, either by the Department or by farmers under Government subsidy, as a result of the destructive work of cochineal distributed in the preceding years. This success in felling is definitely of much wider application than was anticipated two or three years ago, when cochineal showed every sign of very rapid decline. Fortunately, the three seasons of almost continuous drought, which did so much harm in many other directions, served greatly to favour the re-generation of the cochineal infestations through a retarding effect on natural enemies and rendered possible successful felling, not only in problematical zones of the Karroo

prickly pear belt, but also well into the sub-coastal zone. If the felling thus far undertaken is final—and there are good reasons for expecting that it will be final—then the main residual bodies of relatively healthy pear will be confined to a few coastal and subcoastal districts, namely Peddie, Albany, Bathurst, Port Elizabeth and Uitenhage. The success here indicated must be attributed to the work of *Cactoblastis* and cochineal, a third insect introduced, namely, *Lagochirus funestus*, having proved a complete failure in practice in spite of the fact that 628,582 insects were liberated in various localities in the course of several seasons. In an attempt to cope with this residual area, a fourth insect, *Cactophagus spinolae*, has just been imported and is being bred at Uitenhage for trial distribution. In the meantime, scientific observations on the progress of the insects previously introduced are being maintained. For instance, in respect of *Cactoblastis* the general causes of mortality, as also predators, parasites and disease, are all being kept under observation by systematic record. The insect still occurs in small numbers, but at present has no appreciable effect on the re-growth of prickly pear. As far as cochineal is concerned, similar observations are being maintained. Among the more important factors, Coccinellid predators, *Empusa lecanii* (which in spite of drought conditions persist in 60 per cent. of the localities kept under observation), and parasites of *Exochomus* may be specially mentioned. An attempt has been made to use Coccinellid predators towards assisting farmers who are anxious to save their spineless cactus from the depredations of cochineal. Unfortunately, the numbers required for this task render such a project entirely impracticable. On the other hand, cochineal has proved to be very susceptible to some of the new insecticides such as D.D.T., and spray tests are proceeding, although it is feared that their application in practice would prove rather expensive. Jointed cactus cochineal, *Dactylopus near confusus*, has been studied in relation to its effect on jointed cactus, *Opuntia aurantiaca*, with the result that no deterioration of the toxicity of the insect to this weed can be detected and it seems quite certain that if the natural enemies of this cochineal, namely rodents and veld ants, could be dealt with in practice, the insect would immediately regain its usefulness in the eradication of this weed. As regards *L. funestus*, a complete account of its life history and biology thus far undertaken under South African conditions has been prepared. A comprehensive report on the whole effort towards biological control of *Opuntias* during the past fourteen years has also been compiled.

Locust Control and Research.

A full account of locust outbreaks and campaigns conducted is contained in a separate report under the heading "Locust Destruction".

The Brown Locust (Locustana pardalina Wlk.).—The brown locust population has been at a low level throughout the outbreak region. The swarm phase of the species has not been seen anywhere except where hoppers hatched on a small scale from two old nests. There is evidence, however, that the solitary phase is building up to a recrudescence of the swarming phase, but the process has been slow as a result of the protracted drought in the Karroo.

As in previous years, observations on the fluctuation of locust populations have been continued in the Middelburg outbreak area and also on selected farms in the De Aar district. Work on the effect of different grazing practices on the incidence of solitary

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locusts is being continued. An attempt was made to study the question of possible migration among solitary locusts by means of a marking experiment. Nine thousand scattered solitary phase locusts were caught over an area of three morgen. These were marked on the thorax with a yellow lacquer paint and liberated again immediately. Surveys and counts of the locusts carried out on the spot and in the vicinity subsequently indicated that migration of solitary locusts is restricted to short flights only, no marked individuals being recovered more than 800 yards away from the place of liberation.

The area over which observations on the solitary populations are being made has been further extended to include a part of the Kenhardt district, where the farm of Jagbult has been selected for detailed investigations. These investigations include microclimate studies comparable with those regularly carried out in the Middelburg area, and also a botanical survey by the Union Botanical Survey staff.

Senior locust officers have also been assisting the research staff to keep a close check on the incidence of solitary locusts throughout the outbreak region, and records are kept of the population counts taken. In this way it was possible to locate the areas where incipient outbreaks are likely to occur during the coming season and also to ascertain more exactly the environmental conditions, such as rainfall and vegetation types, associated with rapid population increases. More of such data will have to be accumulated before a complete picture is obtained of how solitary populations build up to swarm proportions, particularly in cases where incipient outbreaks occur in areas where the solitary population is known to have been at a low level during preceding locust generations. It now seems almost certain that one explanation of unexpectedly rapid increases in population is that only a proportion of the eggs in the ground hatch when conditions of soil moisture and temperature are marginal as, for example, when the soil is sufficiently moist but temperatures low, or when temperatures are suitable but the soil rather dry. Since locust eggs can remain viable for long periods, the majority of them may accumulate in the ground over a number of generations during periods when such marginal conditions prevail and only hatch when temperature and soil moisture conditions are both optimum at the same time.

Red Locust (Nomadacris Septemfasciata Serv.).—There have been no swarms of this species in the Union during the period under review.

At Lake Rukwa, in Tanganyika, the International Red Locust Control Service carried out a vigorous and successful campaign against a serious incipient outbreak. The Union contributed £10,000 and the services of an entomologist and a senior locust officer for this work. The almost complete destruction of this outbreak has no doubt prevented the initiation of a new swarming cycle such as began in this area between 1927 and 1930, resulting in the regular annual invasions which the Union experienced between 1933 and 1944. A few small swarms are known to have survived these operations and consequently another campaign will be necessary at the end of this year. Swarms have also been reported from Angola, but it is almost certain that these are not the escapes from the outbreak area but rather the tail end of the previous swarm cycle. It is expected that the Union will in future take a full and active share in this effort.

In the Union, regular surveys of the coastal belt and the Eastern Transvaal and Swaziland have been made to determine how long after the disappearance of swarms the locusts can survive in their solitary phase and whether there are any indications that they can then breed up sufficiently to initiate swarming independently of invasion by swarms from beyond the borders of the Union. In the 1944-45 surveys no locusts could be found, but during May and July 1946 the surveys revealed a scattered solitary population in several widely separated localities. It is not certain whether these locusts are the progeny of some that escaped detection the previous year, or whether their parents entered the country in loose swarms without attracting attention or being reported. The surveys will have to be extended and continued to ascertain with certainty whether there are any potential outbreak centres in the Union or not.

With the same objects as outlined above, a survey was made of a large part of the Bechuanaland Protectorate during June-July 1946. The indications are that Bechuanaland is not important from the point of view of initiating the swarming phase, though this should be verified by future surveys, which should also be extended to include the Caprivi Strip.

Cage and Laboratory Experiments.

Research conducted to test substitutes for arsenite of soda as a locust poison has indicated that dinitro-ortho-cresol shows promise in dust or spray form. Dissolved in fuel oils it is a powerful contact spray and has possibilities as a spray from the air against adult locusts which cannot be as effectively controlled as hoppers by means of poisoned bait.

D.D.T. does not seem to be effective against locusts at ordinary strengths, either as dust or spray or in baits.

The new poison, benzene hexachloride, commonly known as 666 or gammexane, has given excellent results in baits, being quick in its action and also practically harmless to vegetation and higher animals. This is now being manufactured in this country and it seems likely that it will replace arsenite of soda entirely in bait against hoppers. Field-scale trials with benzene hexachloride bait will be undertaken during the coming summer months. Laboratory tests have indicated that it can be used in conjunction with the sodium arsenite bait in stock, to which it can be added together with sawdust as a diluent. In this way it seems likely that bait stocks can be doubled for about half of what it would cost to make the same amount of the standard 3 per cent. sodium arsenite-bran bait.

Pests of Citrus and Subtropical Fruit.

False Codling Moth (Argyroplote leucotreta). — Appreciable infestations occurred in various areas over the past season, but nowhere was a very high percentage fruit loss recorded. From long-range observations at Nelspruit, orchards in which thorough sanitation is practised, show a consistently lower loss from this pest than orchards not so treated. In the latter, however, there seems to be little tendency in most seasons towards an alarming increase of the pest. In the last two years the insect has been identified with fungus infection in avocado fruits. In this connection spraying experiments with lead arsenate and Bordeaux mixture, and with a suspension of D.D.T. designed to reduce false codling incidence, have given satisfactory results, the D.D.T. being

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distinctly superior. It has proved cheaper, however, to cover individual fruits with paper bags for the same purpose and this method has given protection superior to that attained by spraying.

Citrus Thrips (Scirtothrips aurantii).—It has now been definitely established that there is no actual difference in the response to tartar emetic and citrometic baits between thrips populations at Nelspruit and Rustenburg. The application of these insecticides therefore stands approved as an effective control measure. In the meantime, further insecticides have been tried in the laboratory and alcoholic suspensions of D.D.T. as low as 0·001 per cent. active ingredient have been found very promising, but 5 per cent. D.D.T. dust was less effective.

Red Scale (Aonidiella aurantii).—In the past few years there have been several cases reported, in which natural control of the pest seems to be in evidence and this has resulted in a wide-spread and urgent interest towards a general use of this method. Such control, however, is usually not of permanent nature and in several cases fumigation has again to be resorted to to save the trees. Work on apparently resistant red scale in the Kat River Valley has been seriously thwarted by prolonged drought conditions, but will be resumed as soon as conditions approach normal. Long-range oil spray experiments which have been carried out for a series of years, are being concluded this year and analyses of the results should shortly be available.

Citrus Snout Beetle (Sciobius granosus).—Work on this insect has been seriously hampered by drought conditions on account of which no infestation occurred, and soil-insecticide tests with pentachlorophenol, which gave very promising small-scale results, could not be undertaken. Physiological work in connection with the biology and nutrition of this insect has also been stopped on account of staff resignations.

At Nelspruit it was found that spraying with Bordeaux mixture for the control of black spot disease exercised a very beneficial effect in the control of the mango weevil, *Cryptorhynchus mangiferae*. Near East London pineapple scale, *Diaspis bromeliae*, reached serious proportions, apparently on account of an upset of biological control which, however, is now largely restored.

Pests of Deciduous Fruit.

Codling Moth (Cydia Pomonella).—In the Langkloof Valley considerable time has been spent in improving codling control on apples, where it was found that the main reason for satisfactory results was to be sought in thorough and regular spraying. In the Western Province the Division is keeping in close touch with efforts towards biological control of codling moth by the Western Province Research Station. In the Transvaal where pome-fruit production is limited, a check is also being kept on the results of spraying at certain convenient localities.

Fruit Fly (Pterandrus capitata and Pterandrus rosa).—At Port Elizabeth new compounds, including D.D.T., are being tested for the purpose of improving baiting, if possible.

Pests of Stored Products.

In so far as tobacco, dried fruit, confectionery, grain and milled products pests are concerned, the main emphasis over the past season was on routine advice. At Capetown research work

in this field has had to be very limited on account of the preponderance of timber insect troubles. At Potchefstroom life history studies of stored-grain pests are being continued and at Port Elizabeth very useful additional data have been compiled on the life history of *Tribolium confusum*.

Forest Insects.

Outbreaks of the pine tree emperor moth, *Nudaurelia cytherea*, in three different areas in the western Cape Province have been successfully controlled by the use of pigs. In the Transvaal, the pine brown tail moth, *Euproctis terminalis*, has suffered a sudden decline from natural causes other than parasites. The latter, however, are steadily increasing towards a more effective complex. In Natal, wattle bagworm, *Acanthopsyche junodi*, wattle looper, *Achaea lienardi* and wattle jassids, mainly *Bythoscopus cedaranus*, continue to receive attention. The records of many years on incidence of disease, general ecology and general biology are beginning to bear fruit in as much as a fairly clear picture of the nature of bagworm cycles and the importance of infestation centres is now being obtained. As a result a double aeroplane-dusting campaign is now in progress, one aspect dealing with general commercial dusting and the other with attempted control of a cycle through the treatment of initial centres of infestation. Incidentally, benzene hexachloride appears to be somewhat better than cryolite and is being tested with a view to ascertaining whether a change of insecticide will yield better practical control. A detailed study of the biology of the wattle looper has been prepared for publication. As regards jassids, a detailed study of the possibilities of resistant strains of wattle has been commenced in co-operation with the Wattle Research Institute.

Timber Pests.

The European house-borer, *Hylotrupes bajulus*, has been receiving greatly increased attention at Cape Town and Port Elizabeth. Surveys at both centres, although not far advanced, are divulging very serious losses and large-scale infestations in certain areas. Regulations have been promulgated for the purpose of checking these infestations, both in local and national interests, but for practical reasons these regulations have had to be revised and should soon be in force in their new form. In the meantime, there have been many hundreds of calls for inspection and advice, not only from private house-owners but also from timber firms, timber preservative firms, private building concerns and national housing schemes. Work on the biology of the pest is steadily proceeding, as also work on chemical methods of control, whilst a brief visit by the Chief of the Division to Sweden has made available valuable European information on the biology and control of this insect. In this connection it may be mentioned that Sweden has developed a new system of heat treatment for infested buildings and this method is so promising that units of the apparatus required have been ordered and should shortly be available for local trial.

Powder-Post Beetle (*Lyctus brunneus*).—Although hundreds of applications for advice are still being received, it is clear that the general incidence of the pest is already on the wane. On the whole, trouble is still largely confined to certain very susceptible species of timber which came into wide use during the war. The local pine timber borer, *Oxypleurus nodieri*, has definitely been found

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in a number of cases of damage to sawn and cured pine timber, in circumstances very similar to typical cases of *Hylotrupes*. The damage, however, generally appears to be less intensive and extensive in character.

The furniture beetle, *Anobium punctatum*, proves to be more widely distributed and is definitely doing very serious damage at both Cape Town and Port Elizabeth. An Ipid beetle, as yet unidentified, appears to be almost as troublesome in Cape Town as *Anobium*.

Field Crop Pests.

Maize Stalk-Borer (*Busseola fusca*).—During the past season, which was characterized by severe outbreaks of stalk-borer in areas where early planting of maize had been possible, much intensive attention was given to circumstances governing the effectiveness of a top-dressing treatment. D.D.T. powder gave excellent results at a very low cost, both for application and material, and a close study of the problem has led to the conclusion that, whilst very gratifying results can be obtained by treating infested plants only, the additional advantages gained by treating all plants in a field at the right time are such as to merit very serious consideration of the advisability of general treatment despite the somewhat higher cost.

Cutworms.—The main species prevalent over the eastern Orange Free State proves to be *Euxoa segetis*, to the biology of which detailed attention has been given over the past year at the new out-station at Bethlehem.

Sweet-Potato Pests.—In Pretoria an outbreak on sweet potatoes of two successive generations of potato sphinx moth, *Herse convolvuli*, was effectively controlled by dusting with calcium arsenate, while at Nelspruit outbreaks of the sweet-potato weevil, *Cylas compressus*, were effectively controlled with 5 per cent. D.D.T. dust.

Lucerne Caterpillar.—Severe outbreaks of the lucerne caterpillar, *Colias electo*, particularly in the Kimberley and Upington areas during the 1945-46 droughts, occasioned serious concern. After field trials, natural cryolite proved to be the most desirable and effective insecticide to use.

Eelworm.—Amongst tobacco pests eelworm received particular attention. Silver concentrations for seed-bed treatment are still promising, but the results were seriously obscured by the unexpected incidence of bacterial disease in beds.

Potato Tuber Moth (*Phthorimaea operculella*), was effectively controlled by dusting calcium arsenate or cryolite at the rate of 25 lb. per morgen; 5 per cent. D.D.T. powder also gave satisfactory results and was found to control potato thrips as well as tuber moth. Centipedes were also successfully controlled by baiting.

Chicory Pests.—In the Alexandria district these have been demanding considerable attention. The main damage appears to be done by a species of weevil as yet unidentified. As a preliminary measure 5 per cent. D.D.T. dust in talc has given very encouraging results. Pest incidence in chicory appears to be intimately tied up with inadvisable crop practices over a series of years.

Vegetable Pests.

Onion Thrips (*Thrips tabaci*). — D.D.T. sprays proved to be effective against this pest and appeared to improve results, but the maintenance of soil fertility still appears to be the more practical method for the control of this pest.

Cabbage Moth (*Plutella maculipennis*), yielded readily to control by the application of both calcium arsenate and D.D.T. powder, but the actual time of application proved to be of the utmost importance.

American Boll Worm (*Chloridea obsoleta*), which is a common pest on many vegetables and also fruits, responds to treatment with 5 per cent. D.D.T. powder, but is evidently much more resistant to this insecticide than other species of caterpillars.

Soil Pests.

In the past two or three seasons soil pests have come to be of ever-increasing importance and have proved responsible for a degree of damage not previously recorded in the country.

Amongst the more important are *Astylus atromaculatus*, more commonly known as pollen feeder, and troublesome mainly on garden flowers and on maize tassels. Recently, however, the larvae of this insect have caused severe damage to stems of field crops such as maize.

Heteronychus arator, generally known as the black maize beetle, has also proved to be of wide-spread importance in certain centres, particularly in the maize belt. Both the larvae and adult beetles damage the young stems and the seeds at germination time.

Associated with *Heteronychus* are a species *Adoretus* doing the same kind of damage, and, at times, the larvae of wireworms (unidentified), whilst millepedes have been causing much damage, particularly to potatoes.

It is evident that the control of these pests will have to be very seriously considered. The field, however, is relatively new for the Union and a great deal of biological work will be necessary. Fortunately, some of these pests at least have responded favourably to treatment of the soil with the newer insecticides such as D.D.T. and gammexane powders, and work along this line is proceeding.

Plant Nematodes.

The most troublesome species in this field is *Caconema marioni*, or root-knot nematode, to which a large amount of experimental work has been devoted at a number of centres, particularly Brits, Rustenburg and the Vaalhartz Irrigation Settlement, in co-operation with the Division of Animal and Crop Production. Most of the experiments are of a long-range nature, involving in particular, soil fertility, the employment of organic matter in the soil and crop rotation. Some of the more important of these experiments are now beginning to yield results. The actual value and volume of these data, however, will increase with every year that passes. The Division is also co-operating with the irrigation settlement authorities in the practical appraisal of various farming systems for different areas selected with a view to minimizing the effect of eelworm on the long-range farm-practice basis. The specific trials near Pretoria have indicated that judicious variation in the time of planting potato crops in the hotter areas, particularly with a view of evading extreme high temperatures during the time of crop growth, can be used with very definite effect towards reducing eelworm infestation in the resultant crop.

Pasture Pests.

In the effort towards establishing the possibility of controlling Karoo caterpillar, *Loxostege frustralis*, by means of imported parasites, nine species of parasites are now available and the technical staff at Grootfontein is being expanded for the purpose of breeding and liberating these in larger numbers than has been possible up to the present. The project is particularly vulnerable in as much as erratic rainfall very strikingly affects host incidence, a fact which makes it difficult to anticipate with any exactitude the number of parasites that should be provided at any particular centre. Furthermore, some of these parasites can be bred only on the larvae of *Loxostege*, which are difficult to handle, and, therefore, the production of parasites is necessarily very slow. Various liberations have, however, been made over the past season and further systematic liberations are planned for the present summer.

Dassies.—Investigations over the past two years have given definite indications—

- (1) that serious damage to grazing is closely bound up with degree of depletion of grazing from other causes;
- (2) that, whilst the actual numbers of dassies in any locality are often high, the breeding potential of the animal is really quite low, amounting to a litter of three per year per adult female;
- (3) that shooting, trapping and hunting with dogs offer very definite possibilities towards strongly reducing local populations, provided that such operations are systematically planned and thoroughly executed;
- (4) that, although the depletion of predatory enemies of the dassie may possibly have a strong bearing on present populations, the problem seems to be definitely approachable along the lines indicated above; and
- (5) that the market for dassie pelts, theoretically available and in recent months more definitely indicated by the fur trade, could probably be exploited towards counterbalancing the cost of destruction or perhaps even be turned to positive gain.

It has not been possible to accord full-time attention to this project, but further investigations are proceeding as staff facilities permit.

Harvester Termites (*Hodotermes* spp.).—Damage to grazing has been very acutely felt during the recent drought periods. The Division is of the opinion that the methods of combat available could prove of great practical use to farmers concerned, particularly if arrangements were made for having these methods explained and demonstrated.

Mound-Building Haymakers (*Trinervitermes havilandi*).—Under the relatively dry conditions and acute shortage of grazing just referred to, the depredations of these common ant-heap termites have become much more conspicuous. There is no doubt that in certain areas local populations have been shown to be very high and, both by virtue of the space occupied by the mounds and by actual destruction of the sparse vegetation, do much to accentuate the grazing shortage. In fact, the indications are that drought conditions definitely favour the multiplication of mounds and militate against the natural decrease of populations attendant on wet conditions. Special attention has been paid to control measures heretofore not definitely formulated for the species and up to the present the indications are that the pest can be brought

under control by a combination of mound destruction and poisoning methods at a cost of about 1s. 6d. per morgen. Incidentally, it has been established that the parasitic fly, *Stomorrhina cribrata*, breeds in the nests of *Trinervitermes* and is almost undoubtedly one of the main factors causing the extermination of colonies of these termites in nature.

Fungus Growers.—These include a number of species, all of which normally feed on waste grass or other vegetable matter and automatically tend to destroy useful elements in grazing when waste cellulose food is at a premium. Work on control measures for these species is proceeding, as is indicated in the following sub-heading.

Termite Damage to Buildings.

The main species involved are *Macrotermes natalensis*, *Macrotermes bellicosus*, *Odontotermes badius*, *Termes latericius*, *Allodotermes schultzei* and *Microtermes havilandi*. In the efforts to combat the larger and more troublesome fungus growers in and around buildings, attention has been given to the improvement of methods for destroying colonies. In the first place, the old arsenic and sulphur method has been improved in the mechanism of application in as much as pressure applied by means of a power-driven mechanism works more quickly and more efficiently. Secondly, various other methods and particularly methods based on the use of the newer insecticides, namely D.D.T. and benzene hexachloride, have been tested in various ways. Briefly, dusts have been rather unsatisfactory because of uneven distribution and repellent effect within the nest. Smoke-borne forms of D.D.T. and benzene hexachloride, on the other hand, are in general very promising. For the application of these, recourse has been had to the employment of several types of smoke bomb, in the use of which a special container for the bomb, consisting essentially of a suitable shaped air-tight metal container, has been substituted for the old air-pump plus furnace arrangement used for the application of arsenic and sulphur fumes. These methods are extremely promising and considerable benefit from the point of view of speed, efficiency and cheapness is expected from their ultimate use. In the practical application of termite-control measures in buildings, active co-operation has been established with various bodies concerned in large-scale building in the country, including the Public Works Department and the Natal National Housing Scheme.

Army Worm.

Special investigations during the actual outbreak, and also several months prior to this, as well as during the winter following last season's outbreaks, have added considerably to our pertinent knowledge of the pest. In the first place, attempts to locate either winter or early summer breeding centres from which the mid-summer and late summer infestations usually appearing from late January to March could directly arise, have not been successful. Although the possibility of success in this direction is not finally excluded, it is evident that for the present the only practical course would be to maintain vigilance at all vulnerable centres and to institute immediate control operations when outbreaks arise. In other words, apart from inferences to be drawn from climatic and pasture or crop conditions, it is not possible to predict invasions. We can, to a certain extent, by inference predict the possibility of local outbreaks, but any campaign planned must, of necessity, depend on outbreaks actually reported. As outbreaks are, as a rule, not

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reported by farmers until they are two or three weeks old, the average situation leaves no time for planning once the intelligence is available. Long-range planning, however, is not only possible and feasible, but seems indeed to be the most feasible method for dealing with this pest. In the nature of the case the individual farmer and farming communities as such are best fitted to maintain the necessary vigilance. Although assiduously maintained observation is essential for this purpose, this is not beyond the capacity of any farmer, as incipient outbreaks, both in cultivated fields and grazing, show up as patches, perhaps slightly but nevertheless distinctly differing in appearance from the rest. At this initial stage the army worms are still very young and concentrated, and under these conditions not only is the area involved relatively small, but the insects are much more vulnerable to insecticides than in their later stages. Experience and trial over the past season has again demonstrated the fact that the application of suitable insecticide dusts at this stage constitutes an effective and economic remedy. Naturally, for crops such as oats or teff a higher cost is justified than for the same area of grazing. Even in the latter case, however, the potential range of a moving local army of caterpillars renders a considerable cost justifiable even on ordinary grazing. As a temporary guide it may be quoted that 20 lb. of dust per morgen, obtained at a cost of, say, 10s., produce highly satisfactory results if applied in good time. Among the dusts available 5 per cent. D.D.T. is outstanding for all caterpillars up to the fourth stage, but natural cryolite is somewhat more dependable for fifth and sixth stage caterpillars. At present there is little difference in the cost. The apparatus required is a dust-blower, preferably of the rotary type, and normally costing somewhere in the range of £6. It is felt that by timely organization, from the point of view both of vigilance and of obtaining the necessary equipment for any given community, farmers could, with a measure of guidance from the Department, readily prevent most of the damage annually suffered. A particular recommendation is that army worm control be made a voluntary community task and that farmers' organizations be extensively made use of, both in the planning and execution of the control work, but particularly for timely purchase of the necessary insecticide and equipment, preferably on a co-operative basis. Recommendations to this effect have already been issued.

Flower Pests.

Among the pests which have come in for particular attention over the past year are carnation thrips, which was very successfully controlled with 5 per cent. D.D.T. dust; carnation worm, which was successfully controlled with calcium arsenate; red spider, which did not respond to sulphur and lime sulphur treatment but against which one of the newer insecticides of promise was tried; white-fly on greenhouse or stoep plants; and *Protostrophus* weevils and mealy bug on ferns, which respond satisfactorily to D.D.T. treatment. Much time has been spent on giving advice to various flower farmers around Pretoria and Johannesburg, where floriculture is a profitable undertaking.

Parasite Laboratory.

Besides handling the introduction of various parasites and other useful insects from overseas, this section is entrusted with the basic study of pests in relation to natural control factors.

Besides routine work, therefore, a vast amount of investigational work is required, for which the staff available is entirely inadequate, as also the housing facilities. Among the more important studies undertaken or completed during the past year, the following may be briefly mentioned. Blow-flies have been studied in the laboratory to gain sound information on the subject of exact relationship and competition between the various species involved, and the following conclusions have been arrived at:—

- (1) The *Lucilia* species are in every way the most successful of our blow-flies and this is evidently why they are always so numerous.
- (2) Competition is limited to seasonal representatives essentially and it is seldom that all four species enter the picture together.
- (3) *Chrysomya marginalis* is not predacious, nor does it seem otherwise fitted to control the numbers of *Lucilia* on carrion.
- (4) The increase of field populations is dependent on factors outside the blow-fly complex itself, namely the increase of available carrion.
- (5) It is competition which is responsible for the violent fluctuations in blow-fly populations, peaks being represented in practice by so-called bad fly-years.
- (6) Competition, therefore, does not have an economically satisfactory result. Carcase destruction is sound in principle, but too inefficient in practice.
- (7) The use of natural control factors renders essential much more detailed knowledge of the flies in relation to the whole of their environment. Some restoration of a natural balance is clearly needed.

Incidentally it was shown that the pupation habits of different species have a very important bearing on their natural protection against parasitism, and much new experimental evidence has been gained on the interaction between blow-flies and their parasites.

Insect Population Studies.

Ephestia kuhniella.—This insect is used in the mass-production of various parasites bred for field liberation. In an effort to improve the efficiency of such production, it has been demonstrated that oviposition is directly dependent on the density of moth population per given area of oviposition medium; that the number of eggs is dependent on the size of the female; that the size of the female again is dependent on the larval density in the medium; that the mortality of larvae in this medium is also directly proportional to the population density and that the size and vitality of individuals are also governed by the suitability of the medium.

In comparing two different parasites on the same host, namely *Microbracon hebetor* and *Chelonus texanus*, a difference in the hunting habit of two parasites was shown to exercise vastly different results in the final degree of parasitism achieved in each case.

Codling Moth.—At Piensaarspoort near Pretoria a promising local parasite complex for codling moth has been shown to exist and every effort is being made to study the possible utility of this complex in conjunction with judicious spraying. Already doubt has been cast on the usefulness of the early sprays in view of the

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balancing effect of egg parasites later in the season and it seems likely that fewer sprays in conjunction with parasite effect will produce equally satisfactory results.

Natural Control of Red Scale.—This subject is being given attention as opportunity arises, but particular detailed attention has been paid to the situation at Letaba Estates, where an exceptionally well-balanced combination of parasites is available. This complex is locally so successful that the possibilities of its wider use under judicious guidance are being investigated.

A number of reports and articles of a highly technical nature in this field of work have been published or prepared for publication.

Tsetse-Fly.—At the invitation of the Director of Veterinary Services, the Division has collaborated in the tsetse-fly campaign (*Glossina pallidipes*) at the Mkuzi Game Reserve. Apart from matters arising out of mutual interest in the insecticides employed and in the technique of spraying, the Division's share in the project consisted of attempts to ascertain the fate of the natural insect fauna of the sprayed area as a result of the spraying. It was unfortunately impossible to prepare the ground by a really thorough survey of the insect fauna, but it was nevertheless possible to obtain a fair idea of the representation of most insect families and to get some idea of the mortality caused by spraying. Briefly, the spraying employed was of so low a concentration that very large numbers of species did not appear to be affected at all, but in all families there were apparently species particularly susceptible and these were decimated in very large numbers. Thus far, however, no signs have been observed of very serious upsets in the general balance of these populations and the indications are that as the area is relatively small, natural influx from outside the treated area would probably soon restore normal conditions. A detailed report will, however, not be possible for a very considerable time; as thousands of species are involved and particularly as these are in general not insects thus far recorded as of economic importance, identification will be a very slow task. Incidentally, a mass of valuable experience has been accumulated on the technique of application for sprays and smokes from the air and on the desiderata of the insecticides for such a purpose, as well as the organization of such a task.

Insect Vectors of Plant Diseases.

Efforts along these lines have still been confined to general assistance towards the maintenance of potato seed against virus diseases and to the vector aspect of krombek in tomatoes and tobacco. The system of double-planting, which has been advocated for a year or two, is being followed as a practical measure against the incidence of the disease in tomatoes. It has also been practised to some extent in tobacco, in which connection, however, there is as yet no complete certainty as to the final quality of the crop as a result of thicker planting. General indications are, however, favourable and this point is being finally tested by the Division of Agricultural Education and Research.

Apiculture.

The Italian queen-bee service is being maintained, though necessarily at a reduced rate on account of the difficulty of obtaining technical staff. The interest in organization amongst beekeepers has shown a definite increase, with the result that five beekeepers'

associations have now been established. The brood-rearing study designed to ascertain the natural fluctuation of hive populations in various areas is still being maintained in several centres. Over nine hundred letters from beekeepers were handled over the period under review and short courses were given at Pretoria, Potchefstroom, Stellenbosch and Cape Town.

Insecticides.

Whilst the main activities under this heading have been conducted by the newly-established section in Pretoria, numerous confirmatory or additional tests have also been carried out by the various out-stations. Much attention has been given to the problem of standardizing D.D.T. products in collaboration with the South African Bureau of Standards. As part of the functions of the section approved experimental dusting apparatus and technique have been developed for the purpose of applying insecticides in dust form accurately and uniformly to a given surface area. The same has been done in respect of liquid sprays. These units have been used extensively towards the standardization of knock-down and residual sprays. In the latter connection, it has been ascertained that residual effect is very strongly influenced by the nature of the surface itself. For instance, unpainted wood, painted wood, distemper, glass, slate and cement differ vastly as to the practical value of the residual spray both shortly after and a month or more after the application. Investigations are proceeding. Incidentally, the inclusion of D.D.T. in distemper does not appear promising from the practical point of view. Much difficulty has been experienced in obtaining satisfactory emulsions of D.D.T. An effective imported emulsifier is not readily available and as a substitute a suitable mixture of extraction naphtha and turkey-red oil was eventually found satisfactory. Some work was also done on synergons for D.D.T. in sprays. Amongst these 5 per cent. ethylene glycol ether was found to be particularly promising. Sesame oil as an activator proved variable in grade and in action. In the course of the year numerous biological tests were carried out towards the standardization of various spray materials. Numerous tests on individual insect pests were carried out, amongst which the following are of special interest:—

Against cochineal, *Dactylopius opuntiae* a 2 per cent. D.D.T. emulsion gave very promising results and a residual effect of two months. It is, however, expensive for use on a field-scale.

Against army worm, *Laphygma exempta*, tests were carried out with 5 per cent. D.D.T., 5 per cent. benzene hexachloride, natural cryolite, calcium arsenate and sodium fluosilicate. The first two mentioned were excellent for larvae up to the fourth instar; after that cryolite and sodium fluosilicate were superior, but as sodium fluosilicate is phytotoxic, cryolite remains the first choice for the present. Calcium arsenate gave inferior results.

On bagworm, *Acanthopsyche junodi*, both 5 and 10 per cent. D.D.T. were much inferior to cryolite, whilst 5 per cent. benzene hexachloride proved somewhat more toxic than cryolite.

Against bagrada bug, *Bragada hilaris*, 5 per cent. D.D.T. gave good results, and 5 per cent. benzene hexachloride was better, giving a quicker and higher kill, but pyrethrum was unsatisfactory.

INSECT PESTS AND THEIR CONTROL.

Against wattle jassid, *Bythoscopus cederanus*, and wattle capsid, *Lygidolon laevigatum*, 5 per cent. D.D.T. was fairly good, but was inferior to 5 per cent. pyrethrum.

Against cabbage caterpillar, *Plutella maculipennis*, 5 percent. D.D.T. gave excellent results and proved superior to cryolite.

Against eucalyptus snout beetle, *Gonipterus scutellatus*, D.D.T. proved superior to cryolite, benzene hexachloride and calcium arsenate for the control of adults, but not so effective against the larvae.

As a soil insecticide against *Sciobius granosus* D.D.T. proved quite ineffective, giving only 30 per cent. kill at a concentration of 1 per cent. as against 100 per cent. kill for pentachlorophenol at a concentration of 0.36 per cent.

Against tsetse-fly, *Glossina pallidipes*, in laboratory tests a 5 per cent. D.D.T. dust at the rate of 10 lb. per acre, gave a complete knock-down within four hours and 100 per cent. kill within twelve hours.

National Collection of Insects.

The space for the collection has been slightly improved, but is still far from satisfactory. In the period under review a number of identifications have been made for individuals and institutions outside the Union, mainly in the African Territories, and much time has been given to the preparation of material from the Mkuzi tsetse spraying experiment. Identification work by the Imperial Institute of Entomology in London has commenced to take shape again and over the past year nine consignments were despatched for identification. Research work on Trypetidae and Curculionidae by members of the staff has proceeded. Amongst the records of pests, apart from *Locustana pardalina* which is referred to elsewhere, the following species should be specially mentioned:—

- (a) *Laphygma exempta*, army worm; severe outbreaks occurred in the Dundee-Vryheid area, as also in the Swaziland lowveld and Portuguese territory south of Lourenco Marques. Small, isolated outbreaks occurred in the Pietersburg area and also in the Transvaal highveld.
- (b) Maize stalk-borer, *Busscola fusca*, caused severe damage in various portions of the maize belt.
- (c) *Astylus atromaculatus* and *Heteronychus arator* caused severe damage on portions of the highveld, the latter insect doing particularly severe damage to potatoes in the soil.
- (d) Wattle bag-worm was seriously on the increase in parts of the wattle areas.
- (e) The pine tree caterpillar, *Nudaurelia cytherea*, caused severe damage to pines in various parts of the western Cape Province.

Amongst the records of pests of less economic importance may be mentioned *Mesoscelis montana*, a hairy caterpillar occurring in the Karoo and apparently a very important potential pest of grazing in that area; an unidentified hairy caterpillar from Maclear, where serious damage to grasslands is reported; *Dalaca rufescens* from Pretoria; *Tylococcus chrysocomae* on bitter Karoo (generally mistaken for cochineal on Karoo veld); *Nudaurelia belina* on Mopani in Bechuanaland and the Northern Transvaal; and *Meliana exul*, identified as a serious caterpillar pest of potatoes in Tristan da Cunha.

Horticultural Services and Research.

F. G. Anderssen, B.Sc. (Agric.), Ph.D., Chief of the Division of Horticulture, Pretoria.

THE activities of the Division of Horticulture essentially concern all horticultural crops such as fruit, vegetables and flowers, and can be divided up under the following three headings:—

- (a) Advisory Work;
- (b) Research; and
- (c) Inspection and Control.

A. Advisory Work.

Most advisory work is entrusted to special officers allocated to this work, who are also required to do a certain amount of research work, but their first duty is to attend to enquiries from farmers by correspondence or by visiting farms or by addressing farmers' meetings. These officers are stationed in various parts of the Union, as for example, at Pretoria, Nelspruit, Bathurst, Port Elizabeth, Joubertina, Oudtshoorn, Stellenbosch, Vaalhartz, Upington and Potchefstroom, and deal with all queries from their particular areas.

During the year under review about 2,600 farms were visited, and over 14,000 letters were written and 22 articles published by officers of the Division. Furthermore, nearly 4,000 visitors called at horticultural stations for verbal advice, and officers addressed 21 farmers' meetings which were attended by a total of over 1,300 farmers. These figures do not include the correspondence by the staff devoted essentially to research work, nor the visits to farms by research officers in connection with their research projects. The activities of the fruit inspection section are also excluded from the above figures.

The demands being made on this advisory service are so great that the existing facilities cannot cope satisfactorily with the requirements of the farming public.

B. Research Work.

There are many research projects which cannot possibly be mentioned in such a short report as this. The general field of investigation only is therefore indicated and the most important immediate results are reported specifically.

Research work is carried out by officers stationed at the horticultural offices at Port Elizabeth, Joubertina and Stellenbosch and at the following stations, namely:—

Pretoria Horticultural Research Laboratories,
Onderstepoort Vegetable Research Station,
Nelspruit Sub-tropical Horticultural Research Station,
Bathurst Pineapple Research Station,
Oudtshoorn Vegetable Research Station,
Vaalhartz Experiment Station, and
Upington Experiment Station.

Citrus.

Nutritional Studies.

(a) The main citrus fertilizer project at the Nelspruit Research Station, referred to as the "Long-Term Project" or "Permanent Fertilizer Project", has yielded significant results for the fourth year in succession, namely:—

- (i) ammonium sulphate decreased the yield, the fruit size and the juice content, and increased the acidity and rind thickness of Valencia oranges;

- (ii) superphosphate and kraal manure produced the opposite effect, having increased the yield, the fruit size and the juice content; and decreased the acidity and rind thickness of the fruit; and

- (iii) potash fertilizers increased the acidity of the fruit.

Thus, on the sandy soil on which this experiment is being conducted, the limiting factor for the first twelve years of the life of the citrus trees has been phosphates.

It is already evident that with an increase in the age of the trees, nitrogen will become the next limiting factor, and no doubt in the next few years the need for nitrogen application will become more evident.

Notwithstanding the lack of positive results with nitrogen applications to date, the orchard in question is one of the finest to be seen anywhere, and the average yield of 508 lb. of fruit per tree for 2,100 trees, with the top average yields of 767 lb. per tree for the best treatments, may be regarded as exceptional in the world for twelve-year old trees.

(b) In a supplementary citrus fertilizer experiment on the Nelspruit Research Station, with trees planted in January 1935, ammonium sulphate, calcium nitrate, nitro-chalk, kraalmanure plus nitro-chalk, in each case plus potassium in the form of potassium sulphate, are tested out against a superphosphate plus potassium sulphate "control" under two systems of cultivation, namely, clean cultivation and green manuring. In this experiment the results with regard to the crop are similar to those obtained in the "Permanent Experiment". Nitrogenous fertilizers do not seem to be essential for growth, yield and quality of fruit during the first twelve years after planting.

(c) In certain investigations being conducted near Rustenburg in the western Transvaal, the form in which nitrogen is applied to citrus trees has been shown to be very important. Although nitrogen in the form of ammonium, such as ammonium sulphate, is the usual nitrogenous fertilizer used, this form of nitrogenous fertilizer may, under certain conditions, have a very deleterious effect on the growth of citrus trees, while the size and the quality of the crop is also adversely affected, the acid content of the fruit being very high and the rind excessively thick.

In the western Transvaal many instances have been found where nitrification of the ammonium to nitrate in the soil is exceedingly slow. In such cases the ammonium ion as such is rapidly absorbed by the tree to the detriment of the tree and crop. Furthermore, the soils in question are naturally poorly supplied with bases, with the result that the ammonium nitrogen actually leaches out easily, contrary to the usual accepted theory which assumes that ammonium nitrogen is not leached out of soils. Where ammonium sulphate is used as a source of nitrogen in such soils, lime should be added to the soil prior to the application of ammonium sulphate. Alternatively, it is much safer for growers to use artificial nitrogenous fertilizers containing nitrogen in the form of nitrate, e.g. nitrate of soda or calcium nitrate.

The influence of the absorption of large quantities of ammonium nitrogen by citrus trees is also being studied in sand and water cultures under controlled conditions. The ammonium ion has been shown to have deleterious effects on the absorption of other ions necessary for normal plant growth, and also to retard root growth very markedly.

(d) Very considerable progress has been made with the development of a technique for analysing citrus leaves with a view to

diagnosing nutritional requirements, with the result that there is reason for optimism regarding the eventual use of this method for quickly determining the fertilizer requirements of citrus trees. This method has already made it possible to diagnose successfully various nutritional problems.

(e) There are many smaller research projects dealing with citrus nutrition which need not be commented on here or mentioned in detail, but a few of these include:—

- (i) the examination of the cross-transfer of solutes from one side of citrus trees to the other;
- (ii) sand and water culture experiments dealing with physiological and nutritional problems of citrus;
- (iii) biological studies of citrus roots;
- (iv) organic *versus* inorganic fertilizers; and
- (v) the importance of trace elements under various soil and climatic conditions, etc.

Root and Rootstock Investigations.

(a) Past reports have indicated the large-scale and comprehensive citrus rootstock projects which are under way. The main consideration at present arising out of the citrus rootstock projects is that of the rough lemon stock *versus* the sweet orange stock for new commercial citrus plantings in the Union. This is of particular importance as large-scale replanting programmes have been started on various citrus estates with a view to replacing the very large numbers of citrus trees in the country which are reaching an unprofitable age.

The results from rootstock experiments started fifteen years ago may be summarized for all citrus varieties as follows:—

Sweet Orange Stock—produces a higher quality fruit right from the first crop, with significantly higher soluble solids and acid content of juice. The fruit tends to have more juice, thinner rinds, and a slightly higher T.S.S.:acid ration. It is expected that the trees will live much longer in good health, and that the fruit will hang on the tree in good condition. Incidence of “greening” is only from half to less than with rough lemon stock.

Rough Lemon Stock—far less trouble to propagate tree in nursery; it can withstand greater adverse conditions after lifting from nursery; it comes into bearing earlier, and up to sixth year of bearing should produce up to 25 per cent. more fruit; the difference in the eighth year is approximately 15 per cent. Fruit size is larger, particularly in early years. Many growers who are interested in improving the quality of South African citrus, and particularly those in areas where difficulty is experienced in meeting the standards for export, are using trees on sweet stock for their new orchards, being prepared to forego the difference in yield.

Results from most of the 56 citrus rootstock plantings continue to indicate that the time will come when specific rootstocks may be used for different citrus fruits and also for different soil types. Such new stocks as tangelo and mandarin for grapefruit and mandarin for Jaffa orange types are showing their inferiority over sweet orange and rough lemon for both of the desirable factors of yield and fruit quality.

The performance of such minor citrus fruits as naartjies, limes, citrons and kumquats on rough lemon, the only stock used for them hitherto in the Union, has been unsatisfactory, but among the 36 stocks to which these sorts have been budded there are certain

stocks which will result in the successful propagation and growth of such citrus species.

(b) Other citrus root studies have shown that subsequent growth of the tree is very materially affected by the condition of the root system at the time of lifting from the nursery. Under certain soil conditions a well-developed lateral root system appears to be very desirable in contrast to a very marked tap root system where lateral roots are nearly non-existent. Nursery practices and methods of fertilizing nursery trees are being investigated, and observations on severity of root pruning, closeness of planting and frequency of irrigation are also being made.

Water Relationships.

Large-scale projects dealing with irrigation practices and their influence on nutrition and general cropping are under way. The trees being used have been propagated specially for the purpose and are of the same parentage and as uniform as possible. Results of great practical value are expected from these investigations, but specific results are not yet available for publication.

Breeding and Selection.

All possible varieties and species of citrus trees are imported from all over the world. As a result, the citrus variety orchard at the Nelspruit Research Station now contains approximately three hundred varieties and species of citrus. Not only are these varieties being tested out under different climatic conditions in South Africa, but the plant material is also available for the purpose of breeding and selecting new and better varieties. So it has already become evident that there are a large number of different strains of the Navel variety of orange grown in the Union; some of them differ so much in quality and characteristics that they could justifiably be given different names.

Other Sub-tropical Fruits.

(a) The production of sub-tropical fruits, other than citrus, forms a very important industry, the value of the fruit produced being estimated at between one and two million pounds. The various variety orchards of avocados, mangos, litchis, pecans and miscellaneous fruits in which the possibilities of leading varieties of the different fruits imported from all over the world are being tested out, play a very important rôle in the present rapid development of sub-tropical fruit plantings. The limiting factor in the commercial planting of those varieties which have already been shown to be superior to the existing varieties grown, is mainly that of shortage of propagation material. After three years of extensive trials, the technique of vegetative propagation of the mango has now enabled the Sub-tropical Horticultural Research Station at Nelspruit to have the first known mango nursery of budded trees in the Union, and distributions of improved mango varieties have already been made.

The variety orchards include approximately 60 varieties of avocados, 70 of mangos, 30 of litchis, 40 of pecans and many miscellaneous fruits.

(b) The variety collections mentioned are also to be used in connection with the breeding of new and improved varieties of fruits. The first outstanding new fruit variety produced at the Nelspruit Research Station is the "Hortus Gold" variety of papaw. It is now in commercial production and in great public favour because of its outstanding qualities.

(c) *Tung Nuts*.—The rootstock trials with *Aleurites Fordii* and *Aleurites Montana* have largely substantiated the results reported on earlier.

All Montana treatments outyielded all Fordii treatments.

The Montana trees budded on Montana rootstocks gave on an average about four times the average yield of the two Fordii selections.

The crops of the Montana seedlings have increased surprisingly, especially if it is taken into consideration that half the trees in this treatment are predominantly male.

The Fordii seedlings outyielded the same strain of Fordii when budded on Fordii rootstock and this again outyielded Fordii budded on Montana rootstock.

The Montana seedling trees, which happen to be predominantly female, produced crops as large as those of the Montana trees budded on Montana rootstocks.

Vegetable Production.

A special section has been established within the Division for the purpose of dealing particularly with vegetable-production problems. Many nutritional, varietal and other investigations have been commenced recently, so that it is unnecessary to report progress at this stage. The activities of the Division in the field of vegetable production are expected to expand rapidly. A few projects which have already produced tangible results may be indicated.

Nutritional Problems.

(a) Chlorosis of spinach and lettuce is a common malady on the Transvaal highveld and middleveld. Investigations have so far shown that the malady is due to a high pH of the soil and an excessive concentration of brak salts.

(b) In connection with beet seed production, a serious problem was introduced by the fact that standard germination tests in incubators, showed a very low percentage germination, whereas soil tests showed a much higher percentage germination. Investigations proved that the beetroot seed contained a high percentage of nitrogen in the form of nitrite. The nitrite nitrogen in turn is toxic to very young seedlings, and therefore killed the seedlings in the standard germination test, hence causing a low percentage germination. When the nitrite is thoroughly washed out of the seed by continuously flowing water for a period of twelve to twenty-four hours, then the standard germination test showed a satisfactory percentage germination of the seed. The problem is being thoroughly investigated in order to determine what nutritional conditions in the field have caused the production of the high percentage of nitrite in the seed.

(c) Tests in connection with thrips on onions have been carried out in co-operation with the Division of Entomology to determine a practical method of combating this pest. It has been found that top-dressings of inorganic nitrogen fertilizers, causing vigorous growth of the young plants, made it possible for the plants to withstand thrips attack without the necessity for expensive spraying.

(d) Weed control, which is a very important factor in the nutrition and growing of vegetables, is being investigated by using various chemicals.

Other Growth Problems of Vegetables.

(a) Samples of all vegetable seeds produced in the Union on a commercial scale are grown in test plots and are compared with one another and also with samples of imported seed. This procedure not only makes possible a comparison with the yield and quality of

imported seed, but also enables the plant geneticists to know where or whether improvement is necessary in the production of mother seed. Such trials are carried out in several different areas under different climatic conditions of the Union.

(b) The control of eelworm in the soil by chemical methods is being investigated in co-operation with the Division of Entomology.

(c) Mulching and irrigation trials in connection with the germination of seed and the production of vegetables are also being carried out. The necessity for protecting seed-beds during hot weather has become evident.

(d) In regard to bacterial diseases of beans and cabbages, various investigations are being conducted in co-operation with the Division of Botany and Plant Pathology with a view to their control. These diseases are carried by seed and the disinfection of seed is therefore a very important commercial necessity.

Breeding and Selection of Vegetables.

(a) At present these investigations are confined mainly to the inbreeding of carrots, beetroot, spinach beet, tomatoes and egg-fruit in order to determine:—

(i) The length of period over which inbreeding can take place without seriously affecting quality—a matter which affects the Divisional policy laid down with growers who produce seed commercially by rigorous selection;

(ii) how the most important characteristics are inherited.

Furthermore, the breeding programme provides for making re-combinations of inbred lines with the object of maintaining or improving quality, uniformity and vigour. Already first and second generation inbreeding has made it possible to single out interesting types of carrots, spinach-beet, egg-fruit and tomatoes. Collections of many different varieties and variant types of carrot, beetroot and tomato have been built up with the object of securing from natural hybridization the greatest possible character combinations to commence a large-scale statistical plant inbreeding and re-combination programme.

(b) Several successful crosses have been produced with peas in order to obtain earlier and more suitable varieties for the semi-tropical conditions of the eastern Transvaal lowveld.

(c) Mother seed of beetroot, peas, tomatoes and Lucullus spinach beet has been produced on a limited scale and has been made available to seed-growers for commercial seed production. Ten lb. of such beetroot mother seed was distributed last season to commercial seed-growers and produced 10,000 lb. of good commercial seed.

(d) Breeding work with tomatoes at the Nelspruit Research Station has produced new strains which are absolutely immune to the bacterial wilt disease which causes havoc in the eastern Transvaal. Back-crossing and inbreeding is still progressing with a view to combining this immunity with a better quality commercial variety of tomato.

(e) Breeding work with cucurbits at Potchefstroom has progressed far towards producing standard quality pumpkins and squashes.

(f) In connection with the breeding of Hubbard squashes with a view to improving size of crop per plant, the Argentine native marrow has been found to be an excellent parent.

Certain plants have been segregated as a result of crossing which have the ability to bear fruit both on the stem and on the runners. Such plants have actually borne fruit on every node, so that more than one hundred female flowers have been counted on a single plant. This is something of very considerable interest when one takes into account the fact that the Hubbard squash normally bears no fruit on the stem and its first fruit on approximately the eleventh node of the runner.

Pineapples.

Investigations in connection with pineapples are conducted mainly in the Pineapple Experiment Station at Bathurst, but also at the Nelspruit Research Station and on a co-operative basis on the farms of commercial growers.

Nutritional Studies of Pineapples.

(a) The main fertilizer trials at the Bathurst Pineapple Station afford a great deal of interest to commercial pineapple growers. Considerable differences in growth and cropping are noted with different fertilizer treatments, notwithstanding the fact that commercial growers in the area generally claim that they can get no response from the application of fertilizers. As the plants reach a more mature age, the differences in growth and production are becoming more marked, and to date the fertilizer treatment involving the application of guano is giving the best results.

(b) Trace elements, particularly manganese, are being found, by leaf-analysis diagnoses, to be important in many pineries. Tests involving the use of manganese and other trace elements have recently been commenced.

Pineapple Selection and Breeding.

(a) Forty-six named varieties of pineapples are still under trial at the Experiment Station at Bathurst. Many of these so-called varieties which were imported are similar in every respect to the two common local varieties known as "Queen" and "Smooth Cayenne". Of the imported "Queen" types, only the "Ripley Queen" shows promise of any superiority over the South African "Queen" pineapple. So far the Australian varieties of "Cayenne" (known as "Cayenne Zuill" and "Cayenne Q.A.S.") are bearing fruits with a single crown, this being a distinct improvement over the South African "Smooth Cayenne" variety which bears about fifty per cent. of its fruits with double or multiple crowns. Eighteen imported varieties have proved of no commercial value.

(b) The original selections of a superior quality strain of pineapple have been propagated and plants have been distributed to interested growers for trial plantings under different conditions.

(c) Many crossings between "Queen" and "Smooth Cayenne" have been made. The seedlings are growing both at Nelspruit and Bathurst and in due course new varieties will become available from these.

Deciduous Fruit.

Nutritional Studies of Deciduous Fruit.

(a) Large-scale fertilizer trials with a large number of varieties of deciduous fruit which are being conducted at the Vaalhartz Experiment Station, have continued to show the necessity for applying phosphatic fertilizers in those areas for normal growth. Whereas nitrogenous fertilizers induced no positive results in the trees for a number of years, the trees are now showing signs of lack of nitrogen. Both phosphatic and nitrogenous fertilizers have now become essential.

(b) Other fertilizer trials in the eastern Cape Province are still in progress but no startling results deserving mention at this stage, have been obtained. The necessity for the application of zinc to many trees in the Langkloof has, however, become evident.

Rootstock and Root Studies.

(a) The excavation of trees in the experimental orchards at the Vaalhartz Station have rendered very interesting data concerning the reaction of different rootstocks when budded to apricot trees.

Apricot trees on Marianna plum stock grew very much better than when budded on peach stock (Transvaal Yellow). The explanation for this appears to be the fact that invariably the Marianna root did not penetrate the soil deeply, and spread mostly in the upper 2 to 3 feet of soil, whereas the peach root penetrated through into the sub-soil, striking the lime strata lower down.

(b) Apple rootstock investigations at Potchefstroom with the variety Rome Beauty on three stocks, namely, Sweet Apple stock, Merton No. 793 and Northern Spy, have shown the following results:—

Trees on Sweet Apple stock are more vigorous than those on Merton No. 793, which in turn are again more vigorous than the trees on Northern Spy roots.

(c) Beurre Hardy pear trees on six different rootstocks and Bon Chretien on eight different rootstocks are being tested out in the Transvaal, in co-operation with the Western Province Fruit Research Station. Elberta peach trees, budded and grafted on five different stocks, are being studied at Potchefstroom.

Selection of Deciduous Fruit.

Various selections of the well-known Kakamas variety of canning peach have been planted out at the Upington Research Station for trial purposes. Not only is there a considerable difference in the various strains, but strains are now available which ripen at different times—a fact of particular commercial importance.

Viticulture.

Most of the viticultural work of the Division is done along the Orange River, with the Upington Research Station as its headquarters. Officers for advisory work on viticulture are also available at Pretoria and Oudtshoorn.

The main fertilizer project with sultana grapes at the Upington Research Station, has already made it clear that applications for phosphatic fertilizers and manure are desirable for best results in that area.

Floriculture.

Although much of the Division's advisory work has to do with commercial floriculture, relatively little serious research work is being done owing to a shortage of trained staff. One of the professional staff of the Division is now being sent overseas to specialize in the study of commercial floriculture and its problems. Amongst the relatively few investigations which have been conducted on commercial flower farms, fertilizer and irrigation methods have been found to be of very great economic importance.

As is also commonly the case with other horticultural crops to-day, trace elements are very important in the nutrition of many flowers. Physiological troubles such as "little leaf", mottling and chlorosis, due to deficiency of zinc or other trace elements, have also been found in flowers.

Seed Production.

The extensive programme for building up a seed production industry in the Union, commenced by the Division of Horticulture at the beginning of last war, has continued to make very satisfactory progress during the year under review. South Africa is to-day very largely independent of imports for its vegetable seed, and other countries in Europe and Africa are taking an ever increasing interest in South African vegetable seed. Not only have many enquiries been received from well-known seed-houses overseas, but very large orders for South African seeds have actually been placed by well-known overseas firms.

The registration and inspection scheme of the Division of Horticulture has made it possible to ensure to a very large degree, that good seed is marketed, and, as a result, farmers have come to realize that certified South African-produced seed is of good quality. This, in turn, has had a marked influence on breaking down the prejudice which exists in this country, amongst South Africans, against seed produced in the Union.

Considerable progress has been made with the breeding of high quality mother seed for distribution amongst commercial seed-growers. Additional staff, trained in the field of plant breeding or genetics, have been appointed to the establishment of this Division, so that future development in this direction can be expected to be even more rapid.

C. Inspection and Control.

The period under review covers a complete deciduous fruit season, as well as the latter portion of the 1945 citrus fruit season, and the first half of the 1946 citrus fruit season.

Citrus Fruit Exports.

The 1946 season showed a return to pre-war organization, and inspection centres with inspectors were set up at the following places throughout the Union, i.e. apart from Union ports and Lourenco Marques:—

Citrusdal (Clanwilliam), Patentie, Sunday's River Valley, Kirkwood, Grahamstown, Fort Beaufort, Muden (Natal), Rustenburg, Koster and Groot Marico, Zebediela, Tzaneen, Letaba, Elandshoek, Nelspruit, White River, Plaston and Karino.

The inspectors also inspected local market fruit prior to its despatch from production points.

Deciduous Fruit Exports.

The bulk of the deciduous fruit crop was again handled and controlled by the Deciduous Fruit Board. In addition to the inspection of export fruit, the inspectors of this Division inspected the Board's fruit at Cape Town and Port Elizabeth and also at inland production points, e.g. Constantia, Elgin, Stellenbosch, Groot Drakenstein, Paarl, Daljosaphat, Ceres, Hex River Valley and Ashton.

There was a considerable increase in exports due chiefly to the fact that Scandinavia took approximately 4,000 tons. Other destinations were, as previously, East and West African ports and the Middle East. A small shipment of grapes went to the United States of America.

Dried Fruits.

The bulk of the dried fruits exported consisted of raisins, and shipments, as during the war, were mainly to the United Kingdom, and to East and West African ports.

[Continued on page 278.]

Protection and Classification of Plants.

R. A. Dyer, D.Sc., Chief of the Division of Botany and Plant Pathology.

Advisory Work.

THIS important aspect of the duties of the Division is steadily expanding in all sections. Correspondence with farmers and the general public, and, to a smaller extent, advisory visits take up a considerable amount of officers' time. But since the end of the war the staff position has improved somewhat and the research and other activities of the Division are being pursued more intensively than was possible during the previous year.

Botanical Section.

Botanical Survey.

The year under consideration saw the revival of the Botanical Survey under this Division. The Prinshof Experiment Station, Pretoria, was constituted the headquarters of the Survey and is the main plant-introduction station.

The first and most important task to be undertaken is well under way, i.e. the completion of a vegetation map of the Union on a scale large enough to be of use to agricultural workers in the field. It is based on the 1:500,000 Irrigation Department map which is complete for the whole Union. It is sufficiently large to show considerable detail, and will allow the work to be completed in approximately three years' time.

A classification of veld types of the eastern summer-rainfall portion of the Union has been made, and the areas occupied by these veld types have been demarcated over the greater portion of Natal, eastern Cape Province, eastern Orange Free State and southern Transvaal. In terms of the Irrigation Department map, this means that Sections 1, 2 and 5 are almost complete and should be ready for the printers during the forthcoming year. Thus the areas of greatest potential agricultural production in the country have been covered during the first year of the survey. The work is of the utmost value to other sections of the Department and has already played an important part in the agro-economic survey of the Union.

The collection, propagation and distribution of seed of useful veld plants are continuing on the veld reserves at Worcester, Fauresmith and Pretoria; while information on the spread of undesirable species of plants is also being accumulated.

A special botanical survey was made of the Kakamas Settlement area, parts of which revealed a serious state of deterioration.

Plant Physiology.

Attention has been focussed mainly on the physiological changes which take place during the wilting of lucerne and *Tribulus terrestris*. When grazed during wilting, these plants may respectively cause the animal disorders commonly referred to as bloating and geeldikkop, and result annually in heavy losses of stock. Plants grown on various types of soils (some known to produce toxic plants under certain climatic conditions) are being investigated with promising results. A common factor has been found in plants in a toxic condition of wilting. It is of relatively unstable character and partly of a saponin nature. The work is proceeding in collaboration with research workers of Onderstepoort.

Herbaria.

The National Herbarium at Pretoria, together with the regional herbaria, Natal Herbarium, Durban, and the Albany Museum Herbarium Grahamstown, handled in the neighbourhood of 10,000 specimens for classification. This service of classification and reporting on plants has been augmented by the appointment of a botanist stationed at Kimberley to serve the north-western Cape Province area.

In addition to serving the field officers of the Division numerous reports have been prepared for veterinary officers, farmers and students on such subjects as medicinal plants, poisonous plants, bee plants, fibre plants, weeds and plants which cause the tainting of milk.

Close touch has been maintained with workers in other herbaria of the Union and a continually expanding measure of collaboration exists with botanists in other African Territories. From within the Union valuable collections have been received from the Bolus Herbarium and the National Botanical Gardens, Kirstenbosch. Donations have also come from Mrs. Faulkner, Mr. Pedro and others in Moçambique; from the Amani Research Institute, Tanganyika Territory; Mrs. Benson in Nyasaland; and Messrs. Hendricks and Quarre in the Belgian Congo; as well as specimens collected by Mr. Milne-Redhead in Northern Rhodesia and Angola. Visiting botanists have made considerable use of the research facilities offered in the Union, one worker from Lourenço Marques remaining for a period of several months.

The following genera received special attention during the year: *Rubus*, *Lippia*, *Salsola*, *Nestlera*, *Acacia*, *Encephalartos* and *Aloe*, while the grasses always require the full attention of a qualified officer. A pamphlet on the common names of grasses is in the press and will be of considerable use to agricultural workers and farmers.

Other publications in the course of publication are illustrations and descriptions for the work *Flowering Plants of Africa*, while a revision of the genus *Tephrosia* and an account of the vegetation of the Wonderboom reserve are nearing completion. Flowering plants new to science and investigated during the year number about a dozen.

Pathology Section.

Potato Diseases.

Work on the production of virus-free seed at the Riet River Settlement entered a new phase when Departmental farming stopped and the settlers took over at the end of summer. Consequently, production was cut so as to provide just enough seed for the settlers and neighbouring farmers to start with; it amounted to about 2,000 bags.

The more important diseases which cause potato stocks to degenerate are carried by aphids. In the past, efforts have centred around the production of seed in areas relatively free from the aphids. Such areas exist in South Africa—Riet River is an example—but the quantity of land available in them is not unlimited. Consequently, the problem has been given a twist, and attention is now being paid to the possibility of minimizing the harm which an infestation of aphids can do, in the hope that the production of good seed can be undertaken in the unlimited land of areas in which aphids occur fairly commonly, though not in very great abundance. The same work will, it is hoped, show how the life of stocks can be extended

PROTECTION AND CLASSIFICATION OF PLANTS.

on the highveld, where it is important to maintain the vigour of stocks for 2 or 3 years, but where the great abundance of aphids renders this difficult, and the organization of the industry makes it unnecessary for stocks to be kept very much longer.

The testing of the Empire Potato Collection for resistance to disease and other valuable qualities continues. The indications are promising.

Bacterial Wilt of Tomatoes and Egg-Plant.

Bacterial wilt continues to occupy considerable attention. The resistant strains of egg-plant, distributed from the Botanic Station, Durban, continue to do well, and are in great demand. No variety of tomato, or species related to it, seems to possess resistance.

Mango Diseases.

A new inflorescence blight, caused by *Physoleptera persea*, caused extensive damage in the Eastern Transvaal. Spraying, or dusting, with a 50:50 sulphur copper mixture effectively controls this disease, *Erysiphe cichoracearum*, and also anthracnose at the same time.

Citrus Diseases.

These continue to receive attention, especially black spot, and pitted stem of grapefruit.

Cereal Diseases.

Wheat.—Leaf diseases and black rust were largely absent during 1945. In 1946, however, young wheat plants were commonly attacked by orange leaf rust (*Puccinia triticea*) and mildew (*Erysiphe graminis*). Root-rot due to *Ophiobolus graminis* was only sporadically observed. In most of the cases the soil proved to be brak. Root-rot due to *Helminthosporium sativum* was more widely prevalent, but affected plants gave the impression of having been attacked previously by some dwarfing disease. Later it appeared that this stunted condition was caused by a virus disease. The causal virus is identical with that of maize-streak disease. The disease is distributed in every wheat-growing district of the Transvaal and should at present be considered the most important wheat disease of the province.

Oats.—The only disease found to be widespread in oats was loose smut (*Ustilago avenae*). In affected fields the damage varied from 30 to 80 per cent. In nearly all cases the infection could be traced to insufficient disinfection of the seed.

Barley.—Covered smut (*Ustilago hordei*) was observed in a few instances. In these particular cases losses from the disease never exceeded 5 per cent.

Maize.—A new ear rot for South Africa caused by *Basisporium gallurum* Moll has been reported. *Gibberella* ear rot was very troublesome this year owing to the damp weather during maturation of the cobs. Boil smut (*Ustilago zeae*) was occasionally observed. Maize-streak disease was widely prevalent during late summer. The low incidence of the disease in early plantings is apparently connected with either the prolonged drought or the severe winter of 1945.

Maize-streak virus was shown to be able to cause a severe stunting disease in wheat and, to infect barley, rye, and oats. The small

grains apparently help to carry a maize-streak infection from one mealie crop to another.

None of the South African maize varieties is immune to the disease. The strain of Hickory King selected at the Empire Cotton Experiment Station at Barberton for resistance against the disease appeared to be quite susceptible in the seedling stage. Varieties from the United States all showed a high degree of susceptibility. Among the relations of maize a variety of *Euchlaena mexicana* and one of *E. perennis* were found which proved immune. They may provide material for breeding resistant maize varieties. Efforts to produce such varieties are in progress. Among wheat varieties, only a few from Canada were found to be resistant.

Wattle Diseases.

Work on the isolation and identification of fungi associated with gummosis and wood rot, and the inoculation of trees with them was continued, as well as work on the vegetative propagation of wattles.

The Division's investigations on wattle diseases were terminated because of the resignation of the responsible officer and our inability to make a suitable new appointment. In any case, the work was soon to be taken over by the Wattle Research Institute being established at the Natal University College.

Plant Regulation and Inspection.

There have been four unfortunate discoveries during the recent past.

On potatoes, wart disease, *Synchytrium endobioticum*, was discovered on the town lands of Volksrust, Wakkerstroom, and Charles-town, just at a time when it was hoped that the country had seen the last of the disease. The usual quarantine measures have been applied.

On sugar-cane, mosaic disease was found in mild form on Co.281 and Co.301. Over the fields as a whole, the average infection is light and rather localized, but on a few estates there are patches of high infestation. A detailed survey is in progress. The discovery of mosaic disease dashed hopes that the disease was under control. When, some years ago, the sugar industry switched from the mosaic-immune Uba variety to resistant Co. types, efforts were made to eradicate the few existing acres of susceptible varieties. Unfortunately, a reservoir of infection must have been left, probably (to judge by local evidence) in native grasses (*Setaria* sp.), and it has spread to the cane fields.

On citrus, blackspot, caused by *Phoma citricarpa*, has existed for years in the wet areas near Pietermaritzburg, but was not seen elsewhere. Now it seems to possess considerable adaptation to drier parts, and has been found in widely separated areas of Natal and Transvaal. It may prove a serious nuisance to the citrus industry.

For grapefruit, the voluntary scheme for the certification of parent trees as a measure against *Psorosis* has had to be abandoned because of the almost universal presence of stem-pitting, a disease of obscure origin, but apparently transmitted by budding. Until such time as it is possible to identify the disease with certainty, it is safer to omit grapefruit from the scheme altogether.

For oranges, the parent-tree certification scheme is going well. The general inspection of citrus orchards for scaly bark has had to be curtailed to allow inspections to be made for mosaic disease of sugar-cane and black spot of citrus.

Inspection of vineyards for bacterial blight has been continued, though at far too slow a pace. About 13 million vines and 200 registered vine nurseries were examined in Somerset West, Stellenbosch, Paarl, Wellington, Worcester, Robertson, Montagu, Swellendam, Bonnievale, Tulbagh and Caledon. As a result of disease infection the farms of two registered nurserymen had to be placed in quarantine.

Horticultural Services and Research.—

[Continued from page 268.]

Canned Fruits, Jams and Vegetables.

During the war the Department of Defence established a Food Technology Section which included in its activities the inspection of all canned foodstuffs produced in the Union; some of this inspection work was done on behalf of the Department of Agriculture and the Food Control Organization. Continuity in this inspection has been maintained, in that the Fruit Inspection Section is now doing this canning inspection, and also undertakes inspections of canned foodstuffs on behalf of the Department of Defence, thus reversing the war-time arrangement.

Inspection of canned foodstuffs is done at the ports and at canning centres, the chief of which are: Paarl, Daljosaphat and Wellington, Groot Drakenstein, Elgin, Wolseley, Worcester, Ashton, Mossel Bay, Port Elizabeth, Durban and Johannesburg.

Agricultural Research and Education.

H. W. Turpin, Ph.D., Director of the Division of Agricultural Education and Research.

THE reorganization of the Department at the end of 1945 facilitated a better co-ordination of research and educational functions. This, in itself, is bound to stimulate the development of research work at the Colleges of Agriculture, which in turn will prove most beneficial in the training of students. Moreover, it will result in a closer co-ordination of the various branches of agricultural research, such as animal husbandry, field husbandry, and grazing.

The Division intends gradually to transfer the responsibility of research to those areas which are being served by the Colleges of Agriculture, so that research schemes may be planned by the relative officers stationed there. The chief aim is the establishment of an effective educational and research service which will at once satisfy the demands of trained farmers and provide the technical staff for field work. In addition, research will be conducted in a manner calculated to direct the future developments of the country.

A serious shortage of professional officers has had a very hampering effect on the developments mentioned above, but did not prevent progress in other directions. The development which did take place is chiefly due to the enthusiasm, diligence and perseverance of the professional staff entrusted with the task of education and research and members of the staff of this Division thus deserve a word of appreciation for the manner in which they discharged their duties under most unfavourable circumstances.

The Division has made good progress during this, its first year. The establishment of the necessary administrative machinery entailed a considerable amount of work, but the results are already apparent in the smooth working of this machinery.

Administration and Staff.

With the establishment of the Division on 1 September, 1945, Dr. H. W. Turpin assumed duty as Director of Agricultural Education and Research, and Dr. A. R. Saunders was appointed to one of the two posts of Assistant Director. The other post is still vacant. Mr. H. H. Cornell was appointed to the new post of Principal Professional Officer (Education) on 1 December 1945, being entrusted with the co-ordination of training at the Colleges of Agriculture and serving as a liaison officer between the Director and the Principals of the Colleges of Agriculture.

Mr. C. R. Liebenberg was appointed Senior Professional Officer (Poultry) on 1 November 1945, to the vacancy which had existed since the death of Dr. Bronkhorst; in March 1946 Dr. J. W. Roland returned from the army to take up his post as Principal Professional Officer (Pasture Research).

In November 1945 Dr. Turpin, as a member of the Irrigation Finance Commission, left for Australia and returned to the Union in March 1946.

From the beginning of June 1946 Dr. A. R. Saunders was in England and America where, as a member of the scientific mission, under the direction of Dr. B. J. Schonland of the Council of Scientific

and Industrial Research, he attended scientific conferences of delegates of the British commonwealth. Since then he has been to the United States of America and Canada to study the latest developments in agricultural research. Dr. Saunders is not back yet.

The staff position was most difficult during the past year and, as stated above, proved to be the greatest retarding factor in the development of both the educational and research work of the Division.

On a percentage basis, it appears that 24·2 per cent. of the higher professional posts on the Divisional establishment and 38·3 per cent. of the posts at the Colleges of Agriculture are vacant, while in the Division as a whole, 29·4 per cent. of the approved posts are vacant.

I. Agricultural Education.

The educational programme of the Colleges of Agriculture for the past year may be discussed under two headings, viz.

- (1) the re-introduction of normal regular courses;
- (2) the provision of special short courses to satisfy the requirements of those ex-volunteers and civilians who cannot enrol for regular courses.

The second half of 1945 was devoted entirely to the second part of this programme but at the beginning of 1946 the Two-Year Diploma Course was again instituted and the Colleges of Agriculture practically resumed their normal educational activities.

Ex-volunteers were given precedence in all courses and it is gratifying to report that they made very good use of the privilege. No qualified ex-volunteer of the Union has been rejected for any course.

The following table reflects the number of students who attended the various courses.

College and Course.	Enrolment.		
	Ex-volunteers.	Civilians.	Total.
<i>Potchefstroom.</i>			
Junior Diploma Course.....	40	—	40
Agricultural Instructors' Course (1 year)	17	—	17
Short courses (1 to 5 weeks).....	380	154	534
<i>Cedara.</i>			
Senior Diploma Course.....	13	—	13
Junior Diploma Course.....	31	—	31
Agricultural Instructors' Course (6 mths.)	19	—	19
Special courses (8 weeks).....	84	8	92
Short courses (1 to 3 weeks).....	94	26	120
Seed-Potato Course (3 days).....	—	90	90
<i>Grootfontein.</i>			
Junior Diploma Course.....	24	—	24
Special Sheep and Wool Course (3 months.)	60	36	96
Soil-Erosion Courses (2 months).....	37	—	37
<i>Glen.</i>			
Junior Diploma Course.....	1	23	24
Special Sheep and Wool Course (3 months)	1	15	16
Grain Grader's Course (4 weeks).....	—	59	59
Short course (1 to 2 weeks).....	28	71	99
	829	482	1,311

Totals for all Colleges (all courses) are as follows:—

	Ex-volunteers.	Civilians.	Total.
Potchefstroom.....	437	154	591
Cedara.....	241	124	365
Grootfontein.....	121	36	157
Glen.....	30	168	198

As regards the Two-Year Diploma Course for 1946, it is noteworthy that a total of 341 applications were received for admission to the course, consisting of 133 from ex-volunteers, 155 from civilians and 53 from persons outside the Union. A total of 132 students, of whom 109 are ex-volunteers were enrolled for the Two-Year Diploma Course. The rest of the ex-volunteer applicants have either withdrawn or transferred their applications to 1947.

Programme and Prospects for 1947.

The Colleges of Agriculture have already received more applications for admission to the 1947 Diploma Course than can be accepted.

The position, according to the latest available figures, is as follows:—

	NO. OF APPLICATIONS.			
	Ex-volunteers.	Civilians.	Applicants from outside the Union.	Total.
Cedara.....	32	18	34	84
Grootfontein.....	9	25	—	34
Potchefstroom.....	19	30	—	49
Glen.....	5	29	—	34
TOTAL.....	65	102	34	201

It should be mentioned that on 1 July 1946, Cedara had received applications for 1947 from 37 Union civilians and 49 others, in addition to 30 Union ex-volunteers, i.e. a total of 116 applicants. Since already at that stage, it was evident that all vacancies in the 1947 Junior Diploma Course at Cedara would be filled by ex-volunteers, 15 Union civilians and 22 other applicants, mostly from Southern Rhodesia, transferred their applications to 1948. Thus Cedara already has sufficient applicants for the 1948 course.

Precedence will be given to ex-volunteers until 30 September 1946 (this date inclusive). Subsequently, all vacancies in the course will be filled by Union civilians.

The programme for 1947 consists mainly of the Diploma Course, both Senior and Junior Courses at all colleges, the Special One-Year Sheep and Wool Course at Grootfontein, the 3 months' Sheep and Wool Course at Glen, and if accommodation permits, a limited programme of short courses of a special nature.

The expected enrolment for 1947 is as follows:—

Senior Diploma Course—all Colleges 110 students.
Junior Diploma Course—all Colleges 135 students.

Sheep and Wool Course, Grootfontein	18 students.
Sheep and Wool Course, Glen	20 students.
Other Courses	80 students.
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TOTAL	363 students.
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Reports of Colleges.

The reports on the work and activities of each College appear as annexures at the end of the Division's report in the following order:—

- (a) Grootfontein College of Agriculture, Middelburg, C.P.
- (b) Potchefstroom College of Agriculture.
- (c) Glen College of Agriculture.
- (d) Cedara College of Agriculture.

II. Research Work.

The reviews of the year's work in regard to research on animal husbandry, field husbandry and pastures, as described in the following chapters, give the desired data on the problems which are being tackled and the results already achieved.

Climatological Research.

Research on climatology was initiated with regard to agricultural problems, the chief aim being the geographical and climatical delimitation of the Union in order to encourage a better distribution of the animal breeds and plant varieties in accordance with their adaptability to climatic conditions.

(a) Research on Animal Husbandry.

The transfer of the former pasture research stations to this Division has rendered possible a more comprehensive animal husbandry research programme. Animal husbandry research has already been commenced at these institutions and in consequence of the close co-operation which is now possible in research between the branches of animal husbandry, field husbandry and pasture, farming problems can now be tackled effectively in their entirety in the various areas.

In the course of the year under review the following aspects of the work were carried out by the institutions indicated below.

College of Agriculture, Potchefstroom.

The nutritional investigation which is being subsidized by an annual grant of £500 by the firm Nasfeeds, has until now been focussed mainly on the nutritional value of South African feed crops.

During the year 62 digestion experiments were carried out on the chief South African hay and pasture crops.

In addition to this, investigation was also carried out on the intake of dry material in the case of sheep running on pasture and receiving hay.

This branch of animal husbandry research (i.e. nutrition) has a big leeway to make up and the shortage of staff is being acutely felt.

Vaalhartz.

The animal husbandry activities aim at the establishment of milk production under irrigation on a payable basis.

With lucerne hay as basis, supplemented by Sudan grass and babala pastures in summer and oats pastures in winter, the milk production unit experiment has given exceptionally good results.

With good producers, it proved possible to maintain a production of more than 4 gallon per cow per day over long periods. The unit consists of 30 cows on 24 morgen.

Sunn-hemp, although somewhat unpalatable, gave satisfactory results as silage.

A unit of diversified farming in which milk production, too, is to play a part, will be initiated this year.

Pig farming received considerable attention and exceptionally favourable results were obtained from the feeding of lucerne leaf meal in conjunction with maize and skim milk.

Mara.

Research on the adaption of exotic as well as indigenous breeds was continued and methods were developed for a more accurate determination of the difference in nature of the various types of coat—a factor which is closely allied to adaptability.

The transmission of this as well as tick-repellent characters is being studied, and breeding herds are selected on the basis of fertility and the ability to secrete sufficient milk for their calves.

Information is being collected in regard to the economic aspect of cattle ranching with different breeds in the bushveld. This information, taken in conjunction with the results of carcass analyses (which were initiated this year) will serve as a valuable guide in the selection of breeds for specific areas.

At the annual sale in May 1946, 32 bulls were sold at £1,007. The maximum price paid per bull was £127. 10s.

Messina.

Observations on the influence of climate on cattle are being continued and determinations of coefficients of resistance to heat once again proved that cattle older than two years suffer less in a hot climate than younger animals.

Dohne.

Experiments conducted with a view to increasing milk production during the summer months on grazing, without concentrates, have proved that the yield of 10 to 15 lb. of milk per day which is possible between October and January on well-managed veld can be exactly doubled by providing 3 hours grazing per day on lucerne and Setaria or on Napier fodder grass. It required 25 morgen of each to provide the extra feed for 30 cows in order to maintain production on this level from December 1945 to the end of May 1946, without having to resort to concentrates.

The Red Poll and Friesland herds are also being used in an experiment in which the economy of various systems of milk production is compared.

The low butterfat content of the milk from the group of cows which are milked once a day and suckle their calves once a day, is a striking feature. According to tests, it amounts to 2.5 per cent., as against 4.072 per cent. for the other group which is milked twice and whose calves are being hand-reared.

Losperfontein.

Immunization of female calves for sale to settlers in heartwater areas was successfully continued. It is hoped that this aspect of the work will be still further extended this year.

AGRICULTURAL RESEARCH AND EDUCATION.

A Jersey-herd has also been introduced at the station and observations of the relative efficacy of the two breeds under these conditions will be made as from this year.

Bathurst.

The prolonged drought seriously hampered the work, especially that done on grazing and milk production.

Interesting results were, however, obtained in regard to the utilization of sweet potatoes on the land by pigs. The work is still in progress and does not permit of final conclusions at this stage. Results obtained so far indicate, however, that the production costs of pork can in this way be reduced, with an increase in fecundity and a reduction in "uintjie" infestation on lands on which pigs are thus kept.

Kroonstad.

The testing of rations for milk production which consist almost exclusively of products which can be grown in this area has now reached a stage at which the results can be profitably used as a basis for research with regard to a farming system for the area concerned.

In the meantime, however, the work is not being expanded, in view of the desirability of shifting the experiment station. In any case lack of the necessary space at the station prevents expansion on any significant scale.

Koopmansfontein.

This station, as also the Rietvlei, Athole, Estcourt and Thabamhlope agricultural research stations now fall under this Division.

Although a considerable amount of preliminary work is still required, it is hoped that the animal husbandry programme will shortly come into full operation. This programme has, inter alia, the following aims:—

- (1) *Beef production.*—Research on the best methods of herd and veld management. The latter aspect includes the control of vermeer bush.
- (2) Milk production on veld: Experiments for establishing whether this form of husbandry can be placed on a footing which will not be detrimental to either the veld or the animal. The economy of milk production on the veld will be compared with exclusive beef production, and the relative suitability of indigenous and exotic breeds for both purposes will be determined.
- (3) The development of a type of Africander cattle with an improved milk production capacity.
- (4) The determination of the most suitable mating season for that area.
- (5) The determination of a sound ratio between the number of cattle and sheep in that area.

Estcourt.

The rearing and finishing of steers up to the age of 2½ to 3 years on veld, grass hay and a small quantity of leguminous hay (for several consecutive years) testify to the value of judicious veld management in the long-grassveld area.

The animal husbandry aspect of the work now merits extension so as to include breeding animals. This extension will be effected as soon as additional land has been acquired.

Thabamhlope.

The preliminary work in connection with the growing of suitable fodder crops, the building up of soil fertility and the utilization of natural veld, has now reached a point which permits of changing over to more intensive systems of animal husbandry.

For this purpose an Ayrshire herd is now being built up for replacing the Red Polls.

Athole.

A Jersey as well as an Aberdeen-Angus herd is being built up here, with a view to initiating a milk cum beef-production unit.

The unit experiments aim at the development of farming systems under different conditions in that area to obtain the most beneficial utilization of the veld as well as of the arable land.

Rietvlei.

Tests in milk production at various levels of nutrition, i.e. various ratios of veld to crops are being initiated this year, with a view to giving guidance to farmers in various parts of the area served by this station. In addition, arrangements are being made for determining precisely the advantages of housing and the feeding of veld hay during winter.

Meat.

Constructive work on the grading of meat was continued.

Experiments were initiated with a view to determining:—

- (i) The physical and chemical properties of beef of all grades.
- (ii) The effect of feeding conditions and winter housing on the growth and quality of slaughter oxen.
- (iii) The carcase quality of Africander and Africander crosses on exotic breeds at various ages and at various times of the year.

At the Rand Fat Livestock Show slaughtering tests were successfully carried out.

(b) Sheep and Wool.

In some parts of the Cape Province the drought of the past year is described as the most devastating in the history of those areas. It had a disastrous effect on the sheep and wool industry. The lamb crops were small, the clip was about 8 per cent. less and the scoured yield was much lower. These factors, in addition to the general poorer quality, resulted in a decline in prices. For example the price per lb. in Durban averaged 1.629 pence less than the previous year.

It is a gratifying feature that the accumulated quantities of wool which the South African Wool Marketing Organization took over from the British Wool Commission on 1 July 1945 have been considerably reduced. The quantity taken over approximated two full clips and on 30 June 1946 the unsold bales numbered 572,670. Almost one-third of this wool was produced by natives, while karakul wool also represents a considerable percentage (± 14 per cent.). The wool sold has, naturally, not reached the sellers yet, but since factories the world over are working almost full time, it is hoped that the leeway will be made up in a comparatively short time.

Karakul Farming.

Karakul farming is flourishing; the highest average prices per pelt received by individual breeders have risen from 28s. in 1943 to 42s. in 1945. In the past season the average figure of 55s. per pelt was obtained by one of the producers.

As a result of these high prices a larger number of wool and meat producers are beginning to transform their enterprises—a tendency which must necessarily ultimately make itself felt on the meat and wool position of the Union.

Dohne.

The Dohne research station is situated in the sour grassveld area of the Eastern Cape Province. The rainfall and climate are conducive to farming enterprises of a more intensive nature which will perhaps also be more profitable than wool production. With a view to these possibilities experiments are being conducted to establish which mutton breeds and/or crosses between breeds are the most suitable for the area. Meanwhile investigation is also being made in connection with crops which lend themselves to fodder production.

The Dorset Horn and German Merino are being crossed with the Merino, and the study in connection with growth, wool production and feed requirements is being continued.

Similar work is being carried out at Kroonstad.

Potchefstroom College of Agriculture.

At this College of Agriculture two Blackhead Persian flocks are being graded up with half and three-quarter bred Dorset Horn × Persian rams. Good progress has already been recorded and the results bear out that in both flocks the first and second generation present a considerable improvement on the pure Persian. The lambs grow faster and their carcasses attain a better grade on the market; they are also heavier.

The work has not advanced sufficiently to allow of comparisons between the two flocks. Work of this nature is also being carried out at the Vaal-Hartz Agricultural Research Station. The three-quarter bred Dorset-Persian ram is being used for grading. Ewes of the first and second generation appear to be eminently suitable for fat lamb production.

This grading has produced valuable information already and should be of great advantage to Persian-sheep farmers.

(c) Horse Breeding.

Heavy Horses.

The renewed interest in the breeding of heavy draught horses which arose during the war, still persists and prices of £210 for young stallions, £350 for mares and £160 for heavy geldings were obtained.

To promote this favourable trend, the Government has acquired five young Percheron mares and two young Percheron stallions from England for the Grootfontein stud. The horses are of good quality and are regarded as a valuable addition to the Government stud for the breeding of heavy horses.

In the course of the year the Clydesdale horse breeders founded their own society; at present four horse-breeders' societies are in existence, viz:—

The Horse and Mule Breeders' Association of South Africa.
The Percheron Horse Breeders' Association of South Africa.

The Saddle Horse Breeders' Association of South Africa and Rhodesia.

The Clydesdale Horse Breeders' Association of South Africa.

In the Cape Province and the O.F.S. several private studs have been founded. In the Ceres-Tulbagh-Worcester-Robertson area for example, eight new studs were established. The Government studs to-day comprise 16 purebred stallions, 56 purebred mares and 66 high-grade mares, as also 12 young mares.

During the past year horsesickness occurred in certain areas in an exceptionally severe degree and the Government lost eight purebred mares and one purebred stallion, viz. "G. Karel".

The percentage of foals bred in Government studs is somewhat low, viz. 55 per cent. It should be borne in mind, however, that this low figure is partly accounted for by shortage of staff and lack of proper facilities. The Government intends to offer short courses in the management and breeding of horses at Colleges of Agriculture. The first of these was held at Glen.

The Horse Improvement Scheme for Farmers inaugurated in 1939 is making favourable progress. Up to the present 1,400 mares have been served, 203 of these during the 1945-46 season.

Light Breeds.

The breeding of horses of a light type for general purposes unfortunately did not progress on the same sound basis as did that of heavy horses. Breeders hold divergent views—a fact which retards the building-up of a horse of a good light type.

The light mares which have been served during the year by Government stallions number 84, as compared with 116 during 1944-45. Five thoroughbred stallions are being kept for this purpose.

Donkey Stud.

The donkey stud at Potchefstroom remains the only source of registered jacks of good quality in the country. The stud is limited to twenty mares. During the year 16 surplus jennies were sold, having been eagerly acquired by farmers, who intend establishing their own donkey studs.

The high prices for young jacks which rose to £210 emphasize the scarcity of good breeding animals.

Under the Improvement Scheme for Farmers, ten jennies were served during the past season.

The overseas demand for horses and mules remains keen and large numbers of mules and horses were exported during the year. U.N.N.R.A. is at present acquiring thousands.

(d) Poultry.

The position as regards posts of poultry officers under this Division at 31 August 1946 was as follows:—(1) 1 Senior professional officer, 5 professional officers (2 vacant) and 9 Assistant professional officers (3 vacant.)

Education and Extension.

As in the past, the demand for poultry officers was again very heavy and the following figures give a survey of the activities of these officers during the past year.

Number of days on inspection work	505
Number of applications from farmers	1,757
Number of farms visited	749
Poultry on farms	512,070
Number of birds classed	142,450
Lectures and demonstration to farmers	81

AGRICULTURAL RESEARCH AND EDUCATION.

Number of farmers attending lectures	1,537
Lectures to ordinary students	207
Lectures to students attending short courses ...	396
Judging at shows	34
Number of letters received	1,441
Number of letters dispatched	1,564
Number of articles written	11

The re-opening of the colleges at the beginning of the year, coupled with a shortage of staff, induced a considerable curtailment of extension services.

Egg-laying Competition.

The entries for the Central Egg-laying Competition at Glen were once again very heavy (Vide Report under College of Agriculture, Glen). At the beginning of the year a competition was opened in Durban, while the competition in Johannesburg was extended and another commenced in Cape Town. The applications for admission to the competition in every case exceeded the available accommodation. It would thus appear that breeders are increasingly realizing the value of tested animals, particularly cocks.

The Poultry Industry.

The first post-war year presents a very critical stage to the industry. In consequence of an acute shortage of maize and shortages of other cereal feeds and animal proteins, considerable reductions in poultry flocks had to be effected. In addition, the number of chicks which were hatched during the past season and which normally would have provided the country with eggs during the winter months had to be considerably curtailed. As a result of the inferior quality of the feeds and the poorer growth of the young birds, the reduced number of pullets and the increased use of eggs in the country, it is quite possible that the country may experience difficulty in satisfying its egg-requirements next winter.

Research Work.

Most of the poultry research work is concentrated at the Potchefstroom College of Agriculture. As a result of the shortage of foodstuffs, the number of poultry at the Colleges had to be considerably curtailed, which virtually led to the cessation of research. The following experiments were in progress at Potchefstroom:—

(i) Bloodmeal together with meatmeal in chicken rations.

(ii) Angola fishmeal in chicken and laying rations. Angola fishmeal is a new product which was placed on the market during the war and is imported from Angola.

(a) Angola fishmeal as compared with locally-manufactured fishmeal and meatmeal in chicken rations. As a result of shortages of other feeds which cannot be supplemented, no definite conclusions could be made.

(b) Angola fishmeal as compared with locally-manufactured fishmeal in laying rations. In this experiment too, no definite deductions can be made.

(iii) The effect of various quantities of proteins in rations on the growth of chicks during various periods of the year.

(iv) Meal pellets as compared with mashes in the rearing of ducks.

(e) Agronomical Research.

A number of projects were conducted at the following colleges of agriculture and research institutes: viz. the Potchefstroom and Grootfontein Colleges of Agriculture, and the research stations at Kroonstad, Nelspruit, Upington, Rustenburg, Hartbeespoort, Vaal-Hartz and Riet River.

Potchefstroom and Grootfontein.

Particulars of the local work on agronomy are published in the separate reports of these two Colleges of Agriculture.

Kroonstad.

At this station attention is focussed more particularly on agronomical problems and the breeding of yellow flint maize is continued. The indications seem to be that there is no or very little difference between the various sound rotational systems and that maize grown mono-culturally produces considerably less than maize grown in any of the rotational systems.

The highest yield of cowpea hay was obtained with a spacing of 6 inches in the rows.

The production of both grain and stover increases with a higher application of superphosphate. The highest relative increase goes hand in hand with the lowest application, viz. 200 lb. superphosphate per morgen.

Nelspruit.

The chief aim of research work at this station is the production of agricultural crops which are suitable for the lowveld areas, the determination of the best cultivation methods for various crops and the establishment of a sound rotational system which will also include vegetables. In the case of most experiments the same results have been obtained for years so that definite deductions can be made.

The programme of investigation included, in addition to the previous experiments, a few projects, and the following are some of the major directions in which research was conducted.

Snuff-tobacco.—The breeding of snuff-tobacco of high quality which will be Mosaic-resistant.

As regards the application of fertilizer to snuff-tobacco, it appears that kraal manure has to be given liberally. The application of comparatively high quantities of nitrogenous fertilizer is also necessary.

Streak disease in maize.—A further improvement in breeding lines was effected in connection with maize resistant to streak disease. The most resistant lines show a slight infestation of 5 per cent, whereas commercial varieties are affected to an extent of from 80 to 90 per cent., the yield per morgen decreasing rapidly with increased infestation of plants. The resistant maize variety is grown fairly generally in those areas where the disease occurs.

Testing of Different Varieties of Cassava.

It would appear that the best varieties yield approximately 14 to 18 tons of roots. This compares favourably with the yields in other countries. Approximately 6,000 lb. of tapioca can be obtained from 15 tons of roots representing a production of about £90 per morgen.

Control of Eelworm.—It can now definitely be accepted that eelworm can be entirely eradicated in beds of soil, provided such beds are kept clear from all vegetation for 18 months at least. Re-infestation by water or implements should be guarded against.

Experiments with Sweet Potatoes.—The work includes the introduction of an experiment in which 49 different varieties of the sweet potato are compared as regards yield, keeping quality, drought-resistance, vitamin and starch content, eelworm and disease resistance and cooking qualities.

Testing of Seed Potatoes from various sources.—It has been indicated once more that marked differences exist in the yielding capacity of seed potatoes obtained from various parts of the country.

Seed potatoes from the Woodbush area again produced good results and although they were outyielded by potatoes obtained from a few Cape sources, the latter were severely affected by scab and rhizoctonia. Thus for the lowveld, the Woodbush area would appear to be one of the best seed potato sources. The size of the seed potato has a definite bearing on its yield. The larger the tubers, the higher the yield per morgen.

Determination of the Suitability of various Crops.—Various crops have been grown for determining their suitability for these parts. The "Guduyathan Bunch" and "Natal Common" or "Improved Spanish" groundnuts are recommended. Sunn-hemp yields about 800-1,000 lb. fibre per morgen. Large quantities of tobacco seed were harvested and sold.

Upington.

This station was founded for the benefit of the large number of farmers and settlers along the lower Orange River, from Buchsburg to the Aughrabies valley—a distance of about 200 miles with irrigable lands. Lucerne, sultanas and wheat sometimes produce exceptionally large crops. The experiments show that most of the crops respond very well to the application of fertilizer, kraal manure and compost, and particularly to nitrogenous applications. The "brack" concentration of the soils is high—a condition which constitutes one of the main problems demanding serious attention.

Apart from variety tests with different crops, the application of fertilizer and compost and the application of a rotational system of cropping, it is most difficult to determine in what direction experiments should be carried out. As a result of abnormal conditions and price fluctuations, the farming system continually finds itself in a state of flux. The cultivation of lucerne, e.g., has been extended tremendously because of the high price of lucerne hay, whereas the area planted to wheat has been reduced and sultana vines have in some cases been removed in favour of the cultivation of lucerne.

Commercial production of vegetable seed, particularly of peas, has grown considerably.

Cowpeas and ordinary beans are attacked so severely by eelworm that the prospects of these crops in this area are not bright. Groundnuts, however, give good yields. Sunn-hemp is grown in the rotational experiments and, since this crop, in addition to being an excellent legume for green-manuring, is almost immune to eelworm attack, the yields of the subsequent crop are considerably higher than those of other systems which do not include sunn-hemp.

Rustenburg.

Good progress has been made with the building programme. Apart from the large air-curing barn, cellars, grading rooms, six flues, ten small experiment flues and two residences which have been constructed, a large laboratory has just been completed at a cost of approximately £30,000. Unfortunately, the houses for the professional staff have not been erected yet although funds are available for the building of two residential houses and bachelor flats. These houses will not be built before 1947. Lack of staff accommodation has a seriously hampering effect on the work. There are many serious problems bearing on insect pests, pathological conditions, physiological phenomena and chemical difficulties which urgently call for a solution.

Although the work has been seriously hampered by lack of the necessary facilities and staff, it is, nevertheless, expected that an appreciable amount of work of considerable importance will be done during the coming season. In the meantime experiments have been

conducted on different varieties of tobacco in connection with flue and air curing, espacement, effect of various types of soil and treatments on the quality of tobacco, breeding work, etc.

Research is being conducted on nicotine tobacco varieties, for which purpose *Nicotiana rustica* and *Nicotiana tabacum* are used.

Hartebeespoort.

The results of the experiments with wheat and tobacco definitely show that soil under irrigation is being drained of large quantities of nutrients. The nitrogen and organic material requirement, especially for winter crops, is very high.

Tobacco production is still on the increase, especially in the case of flue and air-cured tobacco of the light type which is suitable for cigarettes and pipe mixtures. Already the number of flues and barns for curing of light tobacco alone exceeds the 3,500 figure.

The green-manuring experiment has shown that the wheat yield is much higher when the crop is grown on lands immediately after sunn-hemp has been ploughed under instead of being removed as a fodder crop.

In the experiment on water-grass (uintjie) control it was observed that the number of plants decreased considerably more rapidly on ploughed land which is being grazed by pigs than on unploughed land which is also being grazed by these animals.

Velvet beans sown with maize supply excellent pasturage. Valuable data have been collected in this connection.

Vaalhartz.

The data collected in the course of the year agree in most respects with those of the previous years. For example, it has once again been evident that potatoes do not represent a suitable test crop for fertilizer experiments conducted on the type of plot which is to be found on the section. Control of diseases and pests and the proper cultivation of the crop are impossible. In these circumstances, it has been decided to use exclusively such eminently suitable crops as winter cereals, maize (sown early) groundnuts and lucerne as test crops for fundamental fertilizer experiments and then to determine the fertilizer requirements of potatoes and tobacco under more practical conditions of cultivation and rotation.

The supplementation of phosphate and nitrogen is equally important in both cases. This fact is confirmed by the results obtained from compost prepared in a soaking pit. Such compost contains very little nitrogen and consequently is practically useless as a direct manure. Judicious irrigation of soils and crops is of the utmost importance. The irrigation experiments for determining the quantity of water required and the time of application are being continued, and interesting results are obtained.

As regards winter cereals, it has once more been clearly established that sowing must be done moderately early. The value of the Scheepers variety for local sandy soils has once again been proved.

Up to the present a solution of the eelworm problem has not been found, although certain directions for further research have been indicated. The Division of Entomology intends to concentrate more on this matter and is already extending the relative experiments on a considerable scale.

Riet River Research Station.

This research station was established during the year on a part of the Riet River Settlement. This area is regarded as most suitable for the conservation of seed potatoes against degenerative

diseases. The aim is to use this station for the production of virus-free mother potatoes for the industry, with a view to rendering the Union independent of the importation of seed potatoes from Scotland, Ireland and other countries.

Virus-free seed potatoes grown at this station will be supplied for further propagation to seed potato growers' associations, situated in the most suitable seed potato areas so that a sufficient supply of Government certified virus-free seed potatoes may be available to producers of table potatoes. For the time being the Department will concentrate on Up-to-Date varieties, but in the near future attention will also be paid to suitable varieties for the coastal areas of the Southern Cape Province.

Potato Growers' Association.

The certification services of the Department are limited to seed potato growers' associations which were duly founded under the rules and regulations of the Department. Associations of this type registered at present number 47. During the past year these associations accounted for the production of 75,000 bags of Government-certified seed potatoes and it is expected that during the coming year the production of such seed potatoes will exceed 100,000 bags.

The seed potato growers' associations are at present properly organized into 9 regional federations which again have formed a central body, viz. the South African Seed Potato Growers' Union. In order to obtain the necessary funds for a general promotion of the certified seed potato industry, the regional federations have decided to pay a voluntary levy of 5d. per bag on certified seed potatoes grown by their associations to the South African Seed Potato Growers' Union. Certificates are supplied by the Department to the Union mentioned, at 1d. each.

New Zealand Hemp (*Phoridium tenax*).

In the course of the past year a company was induced to undertake the production of this fibrous plant and a plantation of 60 acres was bought at Melmoth in Zululand which produces sufficient suckers for planting approximately another 1,500 acres. On account of the difficulty experienced by this country in obtaining bags, the planting work is being extended as quickly as possible, since the plant produces a fibre which is eminently suited to the spinning and weaving of bags. The Division is at present investigating the possibilities of all suitable fibrous plants with a view to encouraging the cultivation of the most suitable plants on a large scale. Fibrous plants such as sunn-hemp, *Hibiscus cannabinus*, *Urena lobata*, flax and similar plants are now being investigated. At present *Phoridium tenax* which adapts itself to large areas of the country extending from Zululand to George, appears to be one of the most promising plants.

Pasture Research.

The problems bearing on beneficial soil utilization, soil fertility and the maintenance and improvement of our natural flora, are closely allied with the farming intensity in the areas where farming is carried on more extensively, but particularly in those areas where a large-scale development can be expected, such as in the diversified farming and crop-production areas. All these problems are inherent in the methods of soil conservation and veld management. Research work in the past has clearly shown that the necessary information in this connection is not available yet. The first requirement is a thorough knowledge of the veld and the manner in which its vigour can be maintained under conditions of maximum exploitation.

In certain areas work on this matter has made good progress, but in others such as the Karroo, the western stock-farming areas, the north-eastern Cape Province and the western slopes of the Drakensberg Mountains, it is hampered by an acute shortage of staff.

Grass Plantings in Rotational Cropping Systems.

It is a fact generally acknowledged and one which has moreover also been proved, that stabilization of a large part of our cropping areas can be effected by including grass leys in our rotational cropping. In the moister areas, where grasses such as Rhodes-grass, and in the marginal areas, where *Paspalum* can be easily grown, this practice is rapidly developing. In the drier marginal, and in infertile areas, grasses suitable for this purpose have not yet been found—a fact which is ascribable to lack of seed supplies, seeding being the only method by which grass plantings in large areas can be established. A great deal of attention is to-day being focussed on the harvesting of seed, methods for the collection of suitable seed in large quantities, suitable methods of cultivation for rapidly establishing grass lands under unfavourable conditions, the viability of seed, fertilizer, etc.

The inclusion of suitable grasses in the cropping system is by no means a simple matter, since the suitability has to be judged according to the aim of the system, e.g. whether it is intended mainly for a cash or as a fodder crop, whether the croppings area is utilized in conjunction with a large or a small area of veld and whether the soil is fertile or not.

A high standard of soil fertility is required, if some grass plantings are to make satisfactory growth. On the other hand, many cropping lands are most infertile and are in desperate need of the establishment of a perennial grass. It is, therefore, necessary to discriminate between grasses which will adapt themselves to infertile soil and thus initiate the process of building-up, and those grasses which will maintain the fertility of rich soil. The succession of crops, legumes and grasses is a subject of which relatively little is known and rotational cropping experiments are being undertaken under a diversity of conditions both with and without veld grazing, on the so-called unit experiments. In these unit experiments a flock or herd is kept on a definite area and the efficacy of the various methods of veld utilization and rotational cropping system is investigated.

The research of the past has focussed attention on another point of interest, viz., the difficulty of providing stock with sufficient protein. In Europe a mixture of perennial rye grass and clover constitutes the basis of grass planting husbandry, but we in South Africa do not possess similar pastures for the drier crop-production areas. The natural veld of the Karroo, the bushveld and the western districts abound in legumes and other protein-rich plants, but the dry parts of the highveld, the eastern Cape Province and the western Orange Free State experience great difficulty in this respect. The feeding and breeding of livestock will be considerably assisted by the inclusion of perennial legumes in grass plantings in these areas, or alternatively, by the establishment of good leguminous trees such as Mesquite, Honey Locust and the Carob which are planted on a large scale for this purpose in countries bordering on the Mediterranean.

The research work at the various experiment stations described below is focussed mainly on the collection of data in this connection.

which may be expected to furnish the necessary information for the adaptation of soil conservation to the demands made on the soil.

The importation and testing of new grasses are being continued and the work relative to the survey and utilization of soil in those areas served by various research stations is being continued.

The value of good veld-management and conservation practices was thrown into relief during the drought of last year. There still exists an acute shortage of staff, and unless this shortage is supplemented, it will be most difficult to carry research out successfully in areas such as the Karroo, the western slopes of the Drakensberg Mountains, the marginal areas and the dry grain areas.

The data collected during the past six years at the various centres, are now being correlated so as to link up with the second Progress Report, issued in 1940. Below is a recapitulation of the activities at each station.

Estcourt Agricultural Research Station.

The year 1945-46 was definitely the driest year in the history of farming in this district.



(1) Trampled out thorn veld (1938.)

A unit experiment is in progress in connection with veld management where Hereford-Africander cross beef breeds are bred on thorn veld. It is an important fact that thorn veld maintains cattle in good condition during summer as well as in winter after the calves have been weaned. A cow nursing a calf in winter, however, requires supplementary feeding. Mating should therefore be so regulated that all calves are weaned before winter.

Experiments are being conducted with certain patent remedies for the eradication of bush, but the results will not become evident

before next year. Experiments with veld fires in the longgrass-veld, without grazing, once again revealed the undesirability of the practice of early burning and the extremely injurious effect of autumn fires. The mowing of all old grasses after winter for composting has proved to be the best method. Where mowing is impossible the best time for burning is after the first good spring rains, provided that such burning takes place only every alternate year.

Sound methods of veld management have resulted in such an improvement in the veld, that the differences are clearly discernable. A unit experiment on longgrass-veld testifies to the fact that slaughter stock can be economically marketed from the veld.

Fertilizer experiments have been conducted on the yield and composition of veld hay.

The planting of grasses in dongas has yielded very important results. Methods of donga control which, although inexpensive, nevertheless yield exceptional results, have been tested at this station and are practicable in large parts of the Union.

The veld-hay yield amounts to approximately one-third of the ordinary yield. The costs of veld hay were higher on account of the low yield. Important results have been obtained with veld management, veld fires, donga reclamation and grazing experiments on irrigated pastures. The drought has brought the importance of this work into relief.



(2) The same spot as that shown in Fig. 1 (1946): the thorn trees have been removed and the grass cover has been restored by good veld management.

Thabamhlope Agricultural Research Station (Estcourt).

The balance between veld, artificial pastures and crops is a matter which is becoming increasingly important, since crops are doing excellently during dry seasons, whereas the veld and artificial pastures are yielding well during seasons characterized by a heavy rainfall. This aspect is being thoroughly investigated.

The crumb-structure of the soil demands investigation. The influence of kraal manure, compost and artificial pastures on the soil structure is an important factor and is being investigated.

The drought allowed of very little veld growth and the making of veld hay proved uneconomic. Winter fodder had to be provided for cattle.

Rietvlei Agricultural Research Station (Pretoria).

A survey of the agricultural systems of the Bankeveld Area which is being served by the Rietvlei Experiment Station, shows that the requirements and demand of the large centres such as Johannesburg and Pretoria stimulate poultry, vegetable, flower and pig farming and that cattle farming is receding further and further from the cities. The price of land is high and farms are small.

Veld grazing systems on mowable veld show that:—

- (1) prime beef can be produced on veld hay only if bonemeal and salt are added to the rations.
- (2) the carrying capacity of veld is at the utmost 1 beast per 3 morgen. A decrease in the yield of hay is noted from year to year. The grazing intensity is therefore probably too high.

Further experiments are being conducted with a view to determining the balance between veld and arable land and making provision for high-producing animals for 12 months of the year. In this investigation use is being made of pastures, hay, silage and perennial crops.

Soil conservation is the basis of the work at Rietvlei and all lands are being laid out on the contour, contour banks or terraces being constructed, wherever necessary. Roads, drainage furrows, the planting of trees and the construction of a new dam are all being fitted into the conservation system as a whole.

Koopmansfontein Agricultural Research Station (Criquequaland West).

The original aim of the work at this station was to collect data on the control of vermeerbos, a poisonous weed which abounds in this area and annually causes severe stock losses. The actual experimental work dates from the beginning of October 1944 only.

Various systems of grazing are being tested out. On account of the long-term nature of the field experiments, no significant differences can be discerned between the various methods.

In the past no attention was given to animal husbandry, but since dairy-farming is practised so generally in this area, the following problems are now being investigated:—

1. Differences in growth between cows, young heifers and steers kept under ordinary ranching and veld-dairying farming conditions.
2. Differences in milk production of various breeds and crosses.
3. Various calving seasons.
4. Sheep crosses with a view to breeding animals for slaughtering.

The growing of fodder trees and spineless cactus is receiving attention with a view to making provision for fodder in times of scarcity.

Excessive grazing has damaged the veld to such an extent already that "vermeerbos", Cape Slangkop and "maluie", etc., now constitute a menace to cattle farming. Results indicate that the veld, if managed correctly, is capable of marvellous recovery. Farmers are beginning to display an interest.

Towoomba Agricultural Research Station (Warmbaths).

Veld management experiments indicate:—

1. that annual grazing during the same season is not a sound principle;
2. that rapid rotational grazing on very diversified veld is not successful, since the sweeter grasses are selected, and
3. displaced seasonal grazing is the only effective system of veld management.

The problem of selective grazing on very diversified veld is still awaiting a solution. In those cases where mowing for hay is possible, the position is simpler. Large areas of the very diversified veld, however, are of a stony and bushy nature, which renders mowing impossible.

Veld recovery experiments indicate that absolute rest during the period of growth is the most effective method of restoring injured veld. Further investigation is in progress.

Thornbush encroachment presents a serious problem in the bushveld. Research work is being carried out in an endeavour to determine the causes of this phenomenon. Chemical and mechanical methods are being tested out for the effective eradication and control of thorn bush.

The reclamation of old lands is a further subject of investigation. In the nursery various grasses are grown, with a view to finding suitable types which will be a successful ley in a rotational system.

As a stand-by in time of need, fodder trees and spineless cactus are grown, and tests are carried out on these. The chief object of these tests is to supplement the natural veld.

Because of the wide range of veld types found in the Bushveld, co-operative grazing experiments are being carried out on various types of veld.

Gifblaar and gou-siekte bush which annually account for tremendous livestock losses in Waterberg present a serious problem for research.

In order to carry out meteorological observations, a climatological meteorological station has been fully equipped.

Athole Agricultural Research Station (Ermelo).

A feature of the past year was a devastating drought, especially in spring. Feed reserves were exhausted even before the rains fell, with the result that the animals at the institution suffered severe losses in weight until grazing became available. Excessive rains fell once more in January and February exercising a very hampering effect on the cultivation of lands and the making of hay.

Great progress has been made with the preliminary work in the establishment of a milk-unit experiment comprising a balanced farming system with dairy cows, pigs and Percheron horses.

An Africander unit experiment commenced on 1 October, 1943 has already progressed beyond the developmental stage.

During the past season an adequate supply of grazing and hay was available. The provision of green feed for calves during the winter months presents a problem demanding further investigation.

A rotational cropping experiment with grass and maize shows that the alternate planting of these crops gives higher yields than those obtained when these crops are continuously cultivated on the same soil in mono-culture.

Artificial pastures are playing an increasingly important rôle and farmers are displaying much interest in the work already. *Acroceras macrum* and *Setaria*, because of their high yields, high nutritive value and palatability, are two of the most valuable fodder

grasses. These two grasses are being subjected to further tests and should play an important rôle in this area.

In the control of erosion *Acroceras*, especially the runner type, gives excellent results.

Experimental work on veld management has further established the importance of the following factors which had been determined earlier:—

- (i) the area is more suitable for cattle than for sheep;
- (ii) a system of rapid rotational grazing is the most effective method of veld management;
- (iii) severe grazing is the most profitable method on sourveld;
- (iv) a complete rest every few years is essential;
- (v) spring resting, followed by grazing, is disadvantageous to both veld and livestock;
- (vi) it is better to mow sourveld grass than to burn it;
- (vii) the best time for burning is during spring, after good rains.

The keeping of Percheron stallions under the Horse-improvement Scheme B for servicing mares of farmers in the locality is an aspect receiving attention at present.

Dohne Agricultural Research Station (Stutterheim).

The influence of the animal on the veld and *vice versa* under certain systems of veld control with a view to the provision of feeds from the veld in winter, is being investigated.



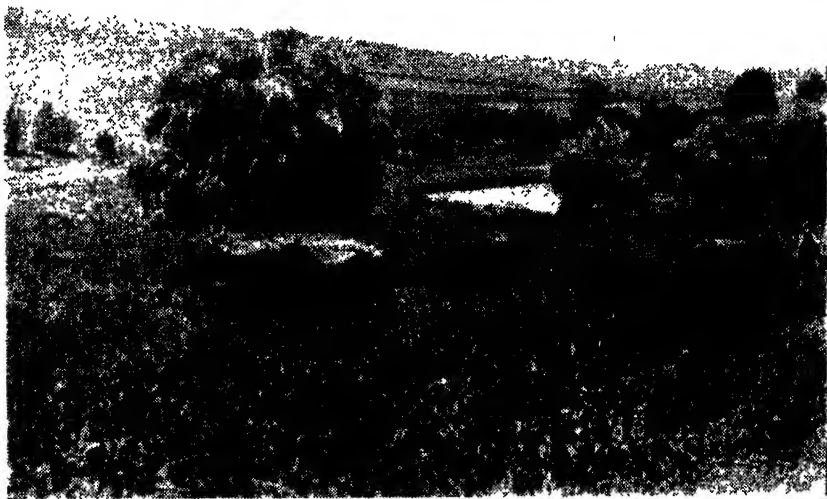
Dohne Research Station. *Se'aria kazungula* being mown five months after planting.

Research is also being conducted on the influence of certain intensities of mowing, fertilizer application and burning on the yield and composition of veld.

The investigational work also includes the supplementation of natural veld by means of artificial pastures and various crops in the form of pastures, hay and silage.

The value of perennial grasses in the building-up of fertility in old played-out lands once again became apparent in a case where a piece of old land which had been under Rhodes grass for four years, showed outstanding increases in yield, as against a piece planted to annuals.

Setaria grasses and Napier fodder are yielding exceptionally highly and are receiving special attention from farmers. In addition, Italian rye-grass, *Phalaris tuberosa*, wild white clover and Chilian red clover are fast gaining popularity as perennial winter pastures.



Cows on a mixture of *Phalaris tuberosa* and Italian rye grass on Mr. McKinnon's farm.

Langebosch Agricultural Research Station (Grahamstown).

The summer season of 1945-46 was perhaps the driest ever experienced in the coastal belt and shortly after the autumn rains set in, frost occurred on a more severe scale than ever before. Experience has induced farmers in the district to build a number of dams and silos. Soil erosion is ravaging the Ciskei to an alarming degree and it is possible that a large percentage of the population will have to be shifted before reclamation work can be undertaken with any success.

An experiment on veld control which is now in its second year, already shows an improved vegetal cover as compared with uncontrolled veld.

The long-term soil fertility experiment envisages the establishment of the influence of certain methods of treatment on the soil where such soil is subjected for a long period to the same treatment. The establishment of grass leys for two and four years is compared with a continuous crop production and the influence of compost is also being gauged.

Two green-manuring experiments were commenced on both good and poor soil and experiments on chicory production are being

conducted in collaboration with the Division of Chemical Services.

Co-operative experiments on the farm Baildon are being continued. Special attention is being given to artificial pastures and lucerne.

• **Grootfontein College of Agriculture—Pasture-Research Section.**

The chief aim of this pasture-research section is to study the various types of veld in relation to soil, climate, topography and the farm animal with a view to ensuring the maximum utilization of the veld, if water and soil are conserved, i.e., to apply good systems of veld management for soil and veld conservation.

This section serves an area of 30,000 square miles of the eastern diversified Karroo.

Small-scale experiments are being conducted on various representative types of veld, with a view to determining the yielding capacity of each and to investigating the influence of the various grazing systems.

The results obtained so far may be summarized as follows:—

- (i) the more promising rotational grazing systems induced a considerable increase in grass and a reduction in the incidence of soil erosion, accompanied by a simultaneous reduction in the density of steekgras and Karroo bush;
- (ii) under systems of continuous grazing the veld changed very little, steekgras and shrubs grew apace and the soil eroded to the same extent as before the experiment;
- (iii) under the system of continuous grazing, sheep maintained their condition better than those sheep subjected to the rotational grazing systems, in spite of the fact that identical numbers were kept per morgen.

Large scale experiments are now being laid out for application on a practical scale. The control system and general treatment will be worked out in collaboration with the other research sections of the institution.

Various fodder trees which are resistant to drought and frost, are being investigated with a view to the provision of feed and shelter.

Potchefstroom College of Agriculture—Pasture-Research Section.

In spite of the relatively poor rainfall during the past year the animals on the veld grazing experiments remained in a relatively good condition.

The drought prevailing during this year proved beyond a doubt that the running of 1 head of cattle on 2 morgen of land as is now being done in the veld-grazing experiment camps, is definitely overtaxing the carrying capacity. It would be more desirable to accept carrying capacity as 4 to 4½ morgen per animal.

On account of the drought the veld on the hay plots did not progress to such extent as to allow of mowing. Experiments are being conducted with artificial pastures as compared with annual crops.

In the nursery, promising grasses and leguminous plants are continually being tested. The demand for Napier fodder and *Setaria kazungula* is exceptionally heavy. Plots have been planted to Kudzu and *Glycine javanica*; the latter has shown a much better stand than the former so far. Twenty six varieties of spineless cactus are progressing extremely well.

A survey of plants was made this season in the whole-year veld grazing camps. The denuded patches in the camps of the rotational grazing systems will be compared with those in the camps which are being continuously grazed.

III. The Colleges of Agriculture.

Grootfontein College of Agriculture, Middelburg, Cape.

(Principal: G. J. Schuurman, H.D.A., F.T.I.)

During the concluding years of the war one of the functions of the College, viz. agricultural education, ceased altogether, but these activities have been resumed this year in spite of the shortage of staff. Although in due course all extension work will be undertaken by the Division of Soil Conservation and Extension, officers were still obliged to devote much of their time to this service. In the case of crop production, lucerne and potato inspection occupied so much time that officers were compelled to curtail research work. Research in other sections has made considerable progress and the Sheep and Wool Research Section has increased its staff from 5 in 1941 to 18.

Exceptionally dry conditions prevailed during the past year and a rainfall of 8.82 inches only was recorded during the year. The veld in particular was poor, which necessitated supplementary feeding and the removal of 58 oxen to other districts for better grazing. Since the storage dams were empty, production was limited to what could be grown with water from fountains and boreholes.

The value of the dryland lucerne of the institution was again appreciated this year when 283 tons were mown on 60.5 morgen: the best part, 18.5 morgen in extent, yielded 205 tons. Owing to lack of water the irrigation lands yielded only 89 tons on 35 morgen. In addition, the production of the farm section was as follows:—165 tons of maize silage; 456 bags of oats, 10 tons of oat hay; 146 bags of potatoes; 41 tons of pumpkins and 9 bags of dried beans; 52 morgen under winter cereals have been grazed.

The *Horticultural Section* plot which measures $1\frac{1}{10}$ morgen produced a bumper crop of 49,520 lb. of vegetables, valued at £206.

The *Animal-Husbandry Section*. The numbers of animals kept are as follows:—64 Jerseys, 35 Frieslands, 64 horses (including Percherons), 36 mules and donkeys and 24 pigs.

A shortage of fodder limited the production of milk and butter. The death of the Jersey cow, "Grootfontein Violet", which holds the milk and butterfat record for South Africa was a heavy blow.

The Percheron stallion, "Lakanal", died during the past year. A Percheron stallion and 5 Percheron mares were imported from England and arrived here in June. Young Percheron stallions and 7 mares were sold for £700.

The sheep at Grootfontein numbering 5,175 produced an income of £5,576, of which £2,401 was derived from the sale of 8 karakul rams and 11 karakul ewes. The prices fetched ranged from £27. 10s to £295 for rams and £47 to £140 for ewes. As a result of the drought the lamb crop obtained from all flocks was small.

The *Poultry Section*. The chief breeds now being kept are the White Leghorns and Australorps (both white and black). Special attention is being focussed on the development of certain desirable strains. As regards the White Australorp, difficult problems have to be overcome, and are receiving serious attention. The general management of the flock has been considerably facilitated by the erection of three semi-intensive houses, each capable of accommodating 100 birds.

The shortage of certain ingredients in the mash, as well as the shortage of maize, is clearly reflected in the production as well as in the general appearance of the birds.

COLLEGES OF AGRICULTURE.

Agricultural Education.

During the year two special three-month courses in sheep and wool and two courses in soil conservation of 8 weeks each were held. The latter courses were intended for ex-soldiers exclusively, while opportunity was granted to civilians to fill the remaining vacancies in the sheep and wool courses.

A total of 133 students attended these courses, 97 being ex-soldiers and 36 civilians. Thirty-four applicants were refused admission.

The re-introduction of the two-year diploma course in February 1946 has found much favour with the farming community. The full number of 24 soldiers has been enrolled. Twenty-one civilian applicants had to be refused admission.

The decision to replace the three-months' course in sheep and wool appears to be equally popular. The number of applications for the two-year diploma and the one-year special course in sheep and wool for 1947 surpass all expectations and consequently a large number of applicants will be disappointed.

Extension Work.—In the course of the year 119 lectures and demonstrations, attended by 2,576 farmers, were given in the country districts. In addition to these, 8 short courses in sheep and wool were held on farms. Officers visited 1,247 farmers on their farms, inspected 584 bulls and made 1,232 preliminary and 737 final soil-erosion surveys. Officers dispatched 13,600 letters; of these, 3,300 were of an advisory nature, and the remainder dealt with administration and agricultural education. The number of visitors to the College amounted to 814. Officers attended 34 conferences and 19 agricultural shows. Officers of the chemical section made 310 analyses for the public and 1,795 in connection with research.

Research Work.

Chemical Services.—In spite of the shortage of staff, numerous analyses were made in connection with research work. In the event of any further development, this Section will have to be enlarged.

Some of the experiments which have been concluded, revealed that the run-off of rain water on denuded soils is 100 per cent. higher than that on grass or bush areas. Moreover, it appeared that a total application of 18 inches of water, either in the form of irrigation or of rainwater, is required for the production of an economic crop of winter cereals and that a four-foot profile should have an available water content of 9 inches at least.

The experiments on fallowing, ammonium sulphate on red Karroo soils, the making and utilization of compost, Langebaan phosphate and locust bait are still in progress, and in many cases promising results may be expected.

Crop Production.—As a result of transfers and resignations of the staff, research work has been seriously curtailed. Further, 40 per cent. of the time of officers was taken up by extension work.

The year was exceptionally dry, only 8.82 inches of rain having been recorded. Severe frost in October caused considerable damage to winter-cereal experiments.

The lucerne-breeding experiment is confined to the inbreeding of various strains, mainly with a view to the production of better hay, pasture and dryland types and of types more resistant to frost.

Twenty potato varieties have been introduced from America and Britain. Since these varieties were received late, a percentage of the seed potatoes were planted at the Bathurst Experiment Station, where superior yields were obtained from the American varieties. The virus content of the plants displayed considerable variations,

the highest infection, viz. 14·7 per cent., occurring in Chippewa, 7 per cent. in Green Mountain (American varieties) and 5 per cent. in Flourball (British variety).

The physical condition of the soil, which had been planted for five years to winter and summer cereals, still shows a decidedly advantageous effect, which, however, is beginning to be less pronounced after three maize crops have been produced.

The spineless cactus on the experiment plot has been severely damaged by cochineal. Observations are being made to determine whether there are varieties which are resistant to the insect; the blue-leaved varieties which as Monterey Chico and Robuste appear to be the most resistant.

Entomology.—On account of the general drought which prevailed during the year no heavy infestations of Karroo caterpillars occurred. During the period February to April, however, a heavy caterpillar outbreak was reported from the southern part of Cradock, where good rains had fallen shortly before.

Light outbreaks occurred during March and April 1946 at Middelburg, but these were confined mainly to vleis where the rain had fallen in strips.

Parasites.—In addition to the three species previously imported, six new species have been introduced, viz., *Meteorus loxostegei*; *Bracon vulgaris*; *Achaetoneura archippirara*; *Cryptus sp.*; *Phoracera sp.*, and *Stomatomyia sp.* All these new introductions readily parasitized on the Karroo caterpillar and have been successfully bred in the laboratory.

As had been done in the past large numbers of the parasite *Chelonus texanum* were again released in the Middelburg district this year. Small numbers of *Cryptus* and *Phoracera sp.* were also liberated. It is, however, not possible to determine as yet whether these parasites will prove a success in the veld.

Sheep and Wool Research.

Nutrition and Veld Management.—The palatability and nutritive value of the prickly pear and agave were compared in nutritional experiments. During a four-month period, merino lambs of 80 lb. live weight gained weight more rapidly on a ration of 5 lb. prickly pears, supplemented by 18 oz. of lucerne hay, than on a ration of 3·6 lb. agave, supplemented by 18 oz. lucerne hay. Agave is less palatable than prickly pears. Sheep are capable of ingesting large quantities of prickly pear—as much as 9·6 lb.—which means that only 10 oz. of lucerne hay is required to supplement the ration.

Chico, a species of prickly pear, is less susceptible to destruction by cactoblastis and cochineal but not as tasty as *Fusicaulus*, although its nutritive value is equal to that of the latter. The spines of the former damages the digestive tract only slightly and in the case of a small percentage of animals only.

A biennial grazing of prickly pear ensures a higher carrying capacity than does an annual grazing.

An annual grazing of salt bush during the winter does not reduce the carrying capacity of such plantations.

In order to ensure satisfactory growth in merino ewes from the age of 4½ months, rations of a high nutritional standard (S.E. 1·913) should be fed. A ration of 20 oz. of maize and 2·5 lb. of lucerne hay per 100 lb. live weight gave the best results. Lower nutritional standards (S.E. 1·535 and 1·337) arrest growth, reduce wool production and have an injurious effect on sex activity, and consequently also on the fertility of ewes. The inclusion of prickly pear does not enhance the effectiveness of a ration provided that 0·5 lb. of lucerne

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hay is replaced by 3 lb. of prickly pear. The poor growth of merino flock ewes which, at the age of 4½ months, weigh 36·0 lb. is due to poor nutrition.

Better results were obtained by feeding young merino ewes according to body weight and not according to body surface (W2/3).

Individual feeding of ewes supplied valuable information as regards the consumption and utilization of feed.

Continuous grazing of Karroo veld with 1 sheep per morgen gives poorer results as regards growth and wool production than a grazing with 1 sheep per 1½ morgen. If short periods of rotational grazing are resorted to, according to calendar months, and not according to seasons, both growth and wool production are poor. If poor systems of grazing are adopted, the losses during drought mount as high as 60 per cent.

Fertility in Rams.—Fertility in rams of 10 breeds and types is being studied throughout the year by means of sperm tests. Clinical abnormalities have occurred already and are being studied. The tests indicate that fertility in certain breeds and types is reduced at times.

Genetics, including Breed and Type Developments.

Type development in merinos (plain-bodied versus ultra plain-bodied type). Considerable progress was made in the application of the technique of description, scoring and progeny testing. Exaggerated faults such as folds on the body and fold-development in the crutch were eliminated and a definite direction in the development of the two types can be established. The ultra plain-bodied sheep are somewhat heavier than those with moderately developed skin folds. The wool yield of the two types in the case of young sheep born in March-April 1944 and shorn at the age of 18 months was as follows (calculated on a basis of 365 days' growth).

	Plain-bodied Type.		Ultra Plain Type.	
	Rams.	Ewes.	Rams.	Ewes.
	lb.	lb.	lb.	lb.
Wool-in-the-grease.....	16·38	13·99	16·58	13·28
Scoured wool (% reclaimed)	7·72	6·98	7·60	6·92
Clean yield.....	48·60	51·50	47·60	53·30

Development of Merino Types less Susceptible to Blowfly Strike.

The object of this policy is to produce a breed that will be less susceptible to blowfly strike.

Blowfly strike occurs on a considerably smaller scale in the "less susceptible" group.

Mutton Breeds and Types.

(a) A Dorset Horn stud and a Southdown stud are being kept.

(b) A ¾-bred Dorset Horn × Merino type is being bred with a view to developing a hardy and good mutton breed which will lamb in autumn.

(c) Dorset Horn × Merino half-bred ewes are superior to Romney Marsh and Border Leicester × Merino half-bred ewes for the rearing of lambs on lucerne pasture during summer and on winter cereal pasture during winter. As many as 140 per cent. lambs are born and these attain a weight of 65 lb. per lamb (a carcase weight of 32 lb.) within 90 to 120 days.

Although pure-bred Southdown rams are the best sires for fat-lamb production, the ¾-bred Southdown × Blackhead Persian rams are

good substitutes, giving even better lambing results.

(d) A very attractive mutton type is being developed from the Southdown \times Blackhead Persian, but unfortunately the birth figure during autumn amounts to 2 to 3 per cent. only.

(e) A fine mutton breed is being developed from the Dorset Horn \times Blackhead Persian. This type lambs in autumn and the lambs reach a marketable weight as high as about 65 lb. at the age of 5 to 6 months on natural veld.

(f) An improved Blackhead Persian is being developed by the employment of a special variation of a F2 Dorset Horn \times Blackhead Persian which is marked in the same way as the Persian. This type is better fleshed, reaches sexual maturity earlier and does not carry superfluous localized fat.

Wool Research.

(a) Wool research is carried out with all merino and cross-bred wool obtained from experimental sheep. Determinations are being carried out of scoured yields, fibre-fineness, fibre length and the presence of medulla in wool fibres.

(b) Only a limited number of inquiries for fleece analyses were received from farmers. The College endeavours to encourage such analyses so that the data may be included in a progeny test scheme which will give better guidance to farmers in their breeding and selection of sheep.

(c) Special studies on the physical characters of wool were carried out at 20 different places on six individual merino sheep. Other studies include changes in the wool of merino rams according to change in age.

Co-operative Experiments on Farms.

Farmers in Colesberg, Hopetown and Fraserburg breed a hardy type of mutton breed from the Dorset Horn, Blackhead Persian on the half-bred basis. Some farmers have progressed so far already that a uniform breeding stud can be selected.

Karakul Grading Up Experiment.

A comparison was drawn between the employment of the curl and flat curl types karakul rams for the grading up of Blackhead Persian ewes. No significant differences between the two types were observed in the skins of the first and second crosses. As indicated by the following figures, however, the curl-type skins of the third cross-bred lambs appear to show a marked improvement as compared with the flat-curl type.

CLASSING OF SKINS.

Type.	No. of Lambs.	Good.	Average.	Too Smooth.
Curl Type.....	16	62%	19%	19%
Flat Curl Type.....	25	32%	20%	48%

Potchefstroom College of Agriculture.

[Principal: G. J. Bosman, B.Sc. (Agric.)]

During the past year drought conditions prevailed and the total rainfall was seven inches below the average of 24.03 inches. The maize crop, however, was saved by good rains during January and March and since the first frost occurred only on 4 June even the late maize varieties reached maturity.

Staff Changes.—The following officers left the institution during the year: Dr. G. C. Theron, Botanist; J. P. v. d. Walt (dairy

officer); Miss Heyns, Matron; E. C. Sanders, Assistant Poultry Officer (resigned); Mr. J. F. Burger, Senior College Officer, resigned for health reasons.

The following officers assumed duty: G. A. Gill, Botanist, was appointed as Senior College Officer (Education); J. G. Marais, Farm Manager; J. G. C. Beukes, temporary instructor in field husbandry; J. W. C. Mostert, Assistant Professional Officer (Pasture Research); H. J. Lighthelm, Dairy Officer; W. A. Poggenpoel, Technical Assistant (Animal Husbandry Research); F. A. Murray (Pasture Research); N. J. H. Thomas, Technical Assistant (Poultry); C. L. Marais, Assistant Poultry Officer; Miss S. Z. M. Kilfoil, Matron, and Mrs. E. K. J. Hoff, Assistant Matron. Mr. H. G. Toua, Assistant to the Lecturer in Poultry has been transferred to the Sheep and Wool Section.

Education.

In August 1945 the One-year Agricultural Instructors' Course was commenced with seventeen students, all ex-volunteers. Fourteen of these successfully completed the course in June 1946. They were all either appointed to posts in the Departments of Agriculture or Lands or else allotted holdings on settlements.

In January 1946, 40 students, again all ex-volunteers were enrolled for the Two-year Diploma Course. In the first semester three of these students withdrew from the course.

A series of short courses in animal and field husbandry, farm management, poultry and horticulture, each covering a period of 10 weeks, were held throughout the year. A total of 534 students, including 380 ex-volunteers, viz. 349 men and 31 women, and 154 civilians (103 men, 51 women) attended short courses.

Other short courses dealt with bees, milk testing (two) and grain-grading.

Extension Work.

Correspondence and visits to the institutions have increased considerably. It would appear that the public is at long last becoming more appreciative of the value of agricultural colleges and is utilizing the services offered by them to an ever-increasing extent. Important among such services are those rendered by the chemical section; 678 soil samples were investigated, 316 manure and fertilizer samples, 169 feeds and 30 dips, water and sundry materials were analysed. Poultry officers visited 353 poultry farms, classed 80,530 head of poultry on farms, wrote 1,793 letters, held 16 lectures and judged at 4 agricultural shows.

Yields.—Owing to the fact that the post of farm manager was vacant between January and October 1945, the farm section suffered tremendously. If unfavourable weather conditions are taken into account, the yields were, generally speaking, satisfactory, as would appear from the following figures: lucerne hay 523 tons, maize 960 bags, maize silage 184 tons, oat cereals 387 bags, barley cereals 77 bags, wheat cereals 41 bags, pumpkin 8 tons, potatoes 255 bags.

Four varieties of maize were grown for seed production and 205 bags of seed maize were sold to the public.

The numbers of livestock on hand on 31 August 1946 were as follows:—Africander cattle 25, dairy cattle (Frieslands, Guernseys, and Jerseys) 97, draught oxen 100, experimental oxen on grazing plots 36, horses 46, donkeys 45, mules 20, sheep 692 and poultry 872.

At the annual stud stock sale on 26 June 1946 the following prices were realized:—One Catalonian jack £84, 15 Catalonian jennies £262, 4 cross-bred horses £96, 13 Africander bulls £488, 1 Friesland bull £68, 2 Geurnsey bulls £30, 1 Jersey bull £32.

Twenty-five head of cattle were transferred to the Mara Experiment Station.

There continues to be a big demand from the public for the servicing of mares and jennies. Eighty-one mares and 12 jennies were served by thoroughbred and Percheron stallions.

Dairy products to the value of £953 were sold and the value issued to sections and hostels amounted to £648. New equipment was ordered to replace that which depreciated during the war. A new cooling-installation is expected shortly.

Seed Testing.

The number of seed samples tested, increased from 301 during 1942-43 to 2,034 during 1945-46. The application of the regulations framed under the Seed and Weed Acts on lucerne, teff seed and other seeds resulted in a great improvement. Almost all lucerne and teff seed sold to-day is of a standard quality. Formerly, teff seed often contained 10 per cent. and more sand and considerable quantities of water grass (quintjie) seed. No prosecutions were instituted during the year since the people concerned clearly indicated their intention of effecting an improvement.

Seed-Growers' Associations in Western Transvaal.

The four seed-potato growers' associations and the two Seed-maize Growers' associations served by officers of the College of Agriculture, gathered fairly good crops for seed during the past season, but the yields of the seed-maize associations were comparatively poor. The membership of the latter nevertheless increased considerably and it is hoped that considerably larger quantities of seed maize will be produced next year. The seed associations do useful work in that they employ the services of research officers of the Department for increasing the seed of new varieties; consequently the founding of such societies is desirable.

Sheep and Wool.

The past year may be regarded as an average one for sheep farming, although bluetongue was very severe in autumn and caused losses. The sheep blowfly was exceptionally active in spring and D.D.T. was successfully used. Ticks, too, were troublesome.

Research Work.

Field Husbandry.—The experiments on which detailed reports are made comprise plant breeding, field husbandry and fertilizer experiments. In the course of the year a new rotational cropping experiment was laid out, including a perennial grass. A grass fallowing experiment was initiated in collaboration with the Division of Soil Conservation and Extension. The grass-breeding work formerly conducted at the Prinshof Grass Breeding Station has been transferred to this Institution.

Arrangements have been made for the institution of large-scale potato breeding experiments in which the material of the potato collection of the Commonwealth will be used.

Plantbreeding.—Progress has been made with the investigation of the breeding of hybrid maize seed. The sweet-corn syntheses have been increased and the seed will be planted during next season for purposes of testing by canners. A certain measure of progress can be reported as regards the sorghum breeding experiment but the continuous cropping on witchweed infested lands and insect pests are hampering factors. The witchweed resistant variety, 37R9, proved so excellent under cultivation and is being so widely used, that it will be quite safe to use it as a basis for future breeding work.

Although the abnormal conditions prevailing during the flowering period prevented the formation of new soybean crosses, the segregating populations nevertheless produced a considerable number of selections.

The issue of the new type, 3706, has probably made practicable the breeding of erect drought resistant cowpeas. Out of the available breeding sources a collection of wild *Vigna*'s has been made and fresh efforts will be directed at crossing them with cultivated varieties.

The wheat breeding experiment has now reached a stage where new combinations between parents with a high-yielding capacity and disease-resistant lines which have been bred earlier are about to be made. Another series of combinations which have now reached the testing stage are those derived from the *Agropyron* hybridization. This group is more promising as a source of disease resistance than most wide hybridizations between wheat species tested at this station.

In the groundnut breeding experiment, the idea is to combine the deserving characters of varieties from South America, Java and the United States of America, all of which are too late for our conditions, with early maturity characters.

The *Agropyron* wheat experiment has yielded annuals of great value to the wheat breeding experiment so far, but for the production of large seeded perennials, the experiment has not been under way long enough for it to be of much value.

Field-crop Experiments.—A large number of the experiments were adversely affected by the theft of green maize ears. The most striking result was that obtained in the experiment of ploughing *versus* superficial cultivation. It is evident that the Faulkner doctrines are not without danger for the South African grain farmer. The reduction of expensive ploughing to a minimum is a matter of common sense and conforms to the requirements of good crop production, but it is quite clear that this method of cultivation cannot be unreservedly abandoned.

The experiment with alternate rows of maize and cowpeas has again revealed that it is a poor policy where a maize crop is the object. This method has certain merits where the production of animal fodder is the main aim.

Fertilizer Experiments.—These data conform to those of previous years wherever phosphate plays the main rôle. In addition this year's results indicate that it does not matter much whether the phosphate is applied in the form of artificial fertilizer, compost or kraal manure. These fertilizers seem to have no effect other than that due directly to their phosphate content. Up till now there appears to be no striking reaction to nitrogen fertilizers, although indications point to an incipient lack of nitrogen in those soils which have been under cultivation for a considerable time.

The oldest fertilizer experiment has been in progress for 24 years. The yield of the unfertilized plots in this experiment still averages 11.25 bags per morgen. This fact testifies above all to the value of effective weed control.

Research on Animal Husbandry.—The work on animal-feed research is mainly focussed on the determination of the nutritive values of South-African fodder crops by means of a series of digestion experiments with sheep. Experiments were conducted with various hays such as lucerne, teff, Sudan grass, etc. Pasture crops such as Algerian oats, Victoria grass, babala, etc., were also tested and comparative results obtained.

Glen College of Agriculture.

(Principal: I. P. J. du Plessis, B.A., M.Sc.)

During the year under review the summer rains fell particularly late—too late for those grain farmers who were compelled to plough and plant with lean oxen. It was thus impossible to plant all lands and where late plantings were effected, it was feared that little maize would mature. Frost, however, was exceptionally late in coming, with the result that reasonably good crops are being harvested. In some districts the harvest is practically normal in spite of the delay of more than a month in planting.

The late rains presaged a good wheat year for the Free State grain farmers, and as a result of the encouraging prices for wheat, more wheat has been planted this year than ever before.

The absence of summer rains until the end of December 1945 resulted in the drying up of the Glen irrigation water supply in the Modder River. For almost 2 months (19 November to 13 January) the lands could not be watered. Fortunately, the lucerne-hay supply of the previous summer was sufficient to tide the livestock over the dry period. In spite of the delayed summer season both as regards harvests and pastures, Glen prospered well, as the figures below indicate.

Features of the Year.

Features of the year were, *inter alia*, the resumption of the Diploma Course and an exceptionally heavy demand for training courses; the Departmental re-organization which separated the extension services from the colleges; the withdrawal of the soil-erosion control staff after the system of broad-base terracing had reached the sixth year of its rapid development; the general shortage of technical staff—the lecturing personnel at Glen having been reduced to a third of its normal strength. On the farmers' side, may be mentioned the organized support of the marketing legislation and the conception of orderly marketing; the growing conviction amongst farmers, especially grain farmers, of the necessity of farming mechanization with its resultant heavy demand for power tractors and similar farming machinery, agricultural implements, etc., the growing realization that precautionary measures are essential to farming, particularly in so far as water and fodder conservation are concerned; the definite development of farming organization in the co-operative direction.

Staff.—The aftermath of war conditions was most exacting on the attenuated staff. Of the 42 approved posts of the salaried staff of the college 30 were occupied on 31 August 1946 (9 out of the 12 vacancies being for higher professional and technical officers) of the 18 Divisional officers normally stationed at Glen, only 9 were left at the college, so that out of a staff of 60 officers, 39 were in the service of the College in 31 August 1946.

Students.

Of the students who attended, 30 were ex-volunteers and 168 civilians. (See table on next page for attendance.) ...

Certificates.—In May 1946, 14 certificates were issued to successful candidates in the Three-months' course in Sheep and Wool Classing. In respect of the Grain Grading Course of May 1946, 19 grain-grading certificates were issued, of which 6 were partial grading certificates.

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Study Bursaries.—Four study bursaries of £15 each were awarded to Diploma students during the year. There was no demand for O.F.S. bursaries from Free State students at Glen.

Employment.—The Institution still receives applications and enquiries in connection with men trained in the various branches of farming and dairying.

The attendance at the various courses held during the year was as follows:—

Course.	Period.	No. of Students.
Judging of Africander Cattle.....	15/10/45 to 19/10/45	24
Junior Diploma.....	5/2/46 to 11/12/46	24
Three Months' Course in Sheep and Wool Classing	5/2/46 to 8/5/46	16
Blacksmithing.....	25/3/46 to 29/3/46	6
Grain Grading.....	29/4/46 to 23/5/46	29
Dairy Farming and Pigs.....	13/5/46 to 23/5/46	17
Farm Engineering.....	27/5/46 to 7/6/46	12
Blacksmithing.....	17/6/46 to 21/6/46	6
Poultry Farming.....	8/7/46 to 19/7/46	13
Cheese Making.....	8/7/46 to 19/7/46	10
Milk Testing.....	22/7/46 to 26/7/46	12
Grain Grading.....	6/8/46 to 30/8/46	29
		198

Livestock.—The numbers of livestock kept for training and research were as follows on 31 August:—

Frieslands	98 (38 grade, 60 stud).
Africander Stud Cattle	74
Stud Horses	13
Draught Horses and Mules	36
Draught Oxen	74
Merino Sheep	1,261
Large White Pigs	21
Poultry	1,020

The hens participating in the Egg-laying Competition are not included in these. No livestock losses worth mentioning are to be reported. All breeds show a good increase and satisfactory production.

Production and Income.—Surplus livestock realized high prices at sales. The demand for grade Friesland bulls and breeding pigs at scheduled prices is heavy. Surplus livestock were sold at about £2,000 cash, apart from free issues to state institutions. After provision has been made for the hostel and other institutions, the surplus farm products (livestock, wool, eggs, butter, meat, vegetables etc.) together with the college and boarding fees gave a cash income of £7,351.

As regards free issues to *other* state institutions, it may be important to mention that during the past 11 years Glen has issued value averaging £700 per annum and received value averaging £369 per annum, free. For the twelve months ending 31 August 1946 the figures are:—issued £518 and received £276.

The irrigation dam in the Modder River was pumped empty on 19 November 1945 and the river did not come down again until 14 January 1946. In spite of the set-back, 272 tons of lucerne hay were made. In addition, 60 tons of other hays and 355 tons of silage were made. As regards dryland maize Glen was fortunate to harvest in this unfavourable year, 312 bags besides the silage. The Friesland herd produced 27,777 gallons of milk, and 3,543 lb. of butter were made for home consumption.

Extension Work.

Although the extension work was to be taken over by the Division of Soil Conservation and Extension as from the beginning of the year under review, this change was effected very gradually and Glen still had to deal with applications for advice, etc., from its area. Owing, however, to the re-introduction of the Two-Year Diploma Course, and the attenuated staff, it was found impossible to satisfy the extension requirements in full. Farmers made extensive use of the telephone, however, and paid personal visits to the institution to make enquiries into various farming matters. The following figures give some indication of certain extension services rendered during the year under review.

13 Shows, 28 Judges.

21 Farmers' days; 38 lecturers; 125 lectures delivered on farmers' days and at demonstrations.

4,421 Persons addressed.

389 Farms visited, erosion work not excluded; 5 wool courses held; 8,730 letters of an advisory nature written, 7 press articles written; 5 articles written for *Farming in South Africa*. 12 radio talks prepared; 2,590 sheep classed; 29,700 head of poultry classed.

Soil and Veld Conservation.—During the first four months of the year under review, the erosion staff consisted of two engineers and six trained assistants. The chief demand was for the survey of the broad-base system of contouring for the protection of lands, but the staff could not cope with the demand. The building of silos and van Meerten dams also received attention. Seventy silos were finally valued, 1,156 reports on dams and other anti-erosion works were prepared and 1,264 inspections carried out.

The broad-base terrace system of contouring is now generally practised in the crop-production area of the Free State. Farmers who can afford to buy the necessary levelling instruments make their own surveys, generally subject to the advice of the Department, but sometimes without applying for subsidies. The number of such broad-base terrace contours completed in this manner with the aid of extension officers this year is unknown, but 1,200 miles of broad-base terrace contours were completed this year under the supervision of Glen, bringing the total completed in lands in the Eastern Free State since 1940 up to 3,520 miles.

The main factors militating against the control of veld still remain the lack of and exorbitant prices for fencing material. Not until fencing material becomes plentiful and cheap will the veld-management problem ease, especially in the western dry areas.

Bull Inspections.—The Animal-Husbandry Section inspected 165 bulls in accordance with the provisions of the Livestock and Meat Industries Act, 1934; of these 42 were registered and 123 grade bulls; 68 bulls (60 grade) were rejected.

Horse-Improvement Scheme.—Owing to shortage of grazing and stable accommodation, this service was temporarily suspended.

Seed-Potato Inspection for the Seed Certification Scheme was carried out on the farms of members of the Westminster, Bethlehem, Tweespruit and Warden Seed-Potato Growers' Associations.

Central Egg-laying Competition.—The Twentieth Open Competition and The Twelfth Breeders' Register Test which were commenced on 3 April 1945, were concluded on 4 March 1946, with the following results.

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Of a total of 1,410 hens entered, 884 hens were accepted as follows:—

Open Competition: 287 heavy and 288 light breeds—575 hens.
Breeders' Register Test: 103 heavy and 166 light breeds—269 hens.

Colleges of Agriculture.—Heavy and light breeds.—40 hens.

The highest producer in the open competition was a Rhode Island Red hen which laid 300 A, 4 B, and 0 C eggs.

In the Breeders' Register Test the best layer was a Black Australorp which produced 304 A, 0 B and 1 C eggs.

The cash and book income of the Central Egg-laying competition amounted to £1,462 of which registration fees represented £314, cash sales of eggs £770. 10s. and issues of eggs for departmental use, £377. 10s. The running expenses of the competition (including labour, feeds and other requirements, but apart from the salary of the Manager) amounted to £1,200.

The Central Competition for 1946-47 commenced on 2 April, 1946. Hens numbering 870 were entered as follows:—

Open competition, 455 hens (240 heavy and 215 light breeds),
Breeders' Register competition 360 hens (170 heavy and 190 light breeds),

Colleges of Agriculture, 55 hens.

Since the results of the Central Egg-laying Competition have a high advertisement value for the owners of birds of outstanding achievement, the number of entries during the past few years regularly exceeded the available accommodation (900 maximum). The figures for the past few years are as follows:—

1944-45: 1,245 entered, 865 accepted.

1945-46: 1,410 entered, 884 accepted.

1946-47: 1,480 entered, 870 accepted.

Farm Improvements.—The team of semi-fit European labourers at Glen continued their useful soil and veld protection work along the fertile, but easily eroded banks of the Modder River. With the completion of the seventh large embankment, an area of more than 25 morgen of severely damaged and threatened soil has been stabilized and largely reclaimed.

Improvements to buildings etc., include the conversion of the old underground hatching room of the poultry section into three useful rooms; concrete partitions, troughs, etc., native location.

As a result of the acquisition of an additional tractor and two motor lorries ox traction and the ox-wagon can now, fortunately, be eliminated to some extent. This gradual modernization of the farm transport vehicles and traction presents a progressive step also from an economic point of view.

Research Work.

The technical staff are continuously studying the climatic and other agricultural factors which condition the productivity of an area in respect of every branch of farming. The various professional officers visit farms either individually or collectively for this purpose. In co-operation with the farmer, experiments are conducted, observations made and farming systems developed. This practical and direct method of investigation has already borne good fruit.

Intensive and full-time research could not be conducted through lack of staff. Mention can, however, be made of the *run-off experiment*

which continues to yield interesting results on the red soil of Glen with a 5 per cent. gradient, and of certain *field-crop experiments* which were in progress during the year under review, viz.—

- (1) *The Rotational Cropping Experiment* which will be discontinued next year.
- (2) *The Maize Variety and Spacing Experiment*, which is being continued, but has been hampered by the drought of the past year.
- (3) *The Sweet Sorghum Variety Experiment* for silage purposes in which "Wintersome" showed a production of 41½ tons per morgen this year. Next came "Soetriet" 284 with a yield of 28·8 tons per morgen followed by "Haakdoorn" with a yield of 28·5 tons per morgen.
- (4) *The Boer-Millet Rate of Seeding Experiment*, in which the highest hay yields were obtained from those plots sown to 35 lb. of seed per morgen.
- (5) *The Millet Variety Experiment* for hay purposes, in which the "Proso-millet" with a yield of 6·4 tons per morgen outyielded the other varieties.
- (6) *The Cowpea Variety Experiment* which was affected by climatic conditions, but is being continued.
- (7) *The Soybean Variety and Spacing Experiment* for hay purposes in which selection No. 34. S. 288 yielded 4·5 tons of hay per morgen and No. 34 S. 395, 4·3 tons of hay per morgen.
- (8) *The Teff Variety Experiment* for hay in which "Inbruin" with a yield of 7 tons of hay per morgen made the best show as compared with ordinary brown teff, Inwit, Uniwit, Erowit and Unibruin.
- (9) *Potato-Variety Experiment*.—The following 15 varieties of imported seed potatoes were planted: Ulster Gromligh, Ulster Earl, Stormont Star, Stormont Dawn, Arran Peak, Up-to-Date (Irish), Up-to-Date (Suttons), Up-to-Date (Castel), Kerr's Pink, Flourball, Epicure, Arran Chief, King George, Sebago and Sequaia. The Irish Up-to-Date with a production of 185·3 bags per morgen was significantly better than Stormont Star, Ulster Earl, Sebago, Arran Chief, Arran Peak, Kerr's Pink, Flourball, King George, Epicure and Stormont Dawn. Stormont Dawn with a production of 84·3 bags per morgen was significantly poorer than the rest, except Epicure. Virus infection occurred significantly less in Stormont Dawn, Up-to-Date (Irish), Arran Peak and Up-to-Date (Castel) than in Sebago, Kerr's Peak, Ulster, Gromligh and Sequaia.
- (10) *Potato-Variety Experiment with Canadian Seed Potatoes*.—The following six varieties were planted: Bliss Triumph, Green Mountain, Katahdin, Irish Cobler, Hauma and Chippewa. Green Mountain, with a production of 162·8 bags was significantly better than the others. Irish Cobler, with a production of 113·4 bags per morgen was significantly poorer than all others. As for virus infestation Chippewa was significantly poorer than all others.
- (11) *Maize Fertilizer Experiment in the Sandveld Area*.—Owing to the drought these experiment plots in the Hoopstad District were not planted this year.

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Cedara College of Agriculture.

[Principal: J. Fisher, N.D.A., B.Sc.(Agric.), D.Sc.]

The staff strength of the college on 31 August 1946 was as follows:—

Professional Officers stationed there.	31/8/46		31/8/45	
	College.	Div.	College.	Div.
Higher.....	9	4	9	7
Lower.....	—	1	—	—
General.....	12	3	12	2
Clerical.....	4	—	3	—
	25	8	24	9

In the past year several staff changes occurred, e.g. Mr. Allison was appointed Lecturer in Dairying; Mr. Coetzee, Botanist, was transferred to Glen and Mr. Theron, First Grade Clerk, resigned from the service. Several new appointments have been made, namely Messrs. Ross and Sifman in Field Husbandry, Mr. Saayman in Horticulture, Mr. Spronk in Animal Husbandry (subsequently resigned). Mrs. Howe as Assistant Matron.

In the past year Dr. Fisher took 6 months' leave and during his absence the Senior College Officer, Mr. A. J. Taylor acted as Principal.

Education.

Diploma Courses.—This course was re-opened on 28 January 1946 with 13 Senior and 31 Junior students. Since the resumption of the course, 4 Senior students have left, all in June. These students have qualified for the Diploma. One junior student withdrew from the course.

The total number of students at present attending the course is 9 Senior and 30 Junior students.

Short Courses.—The following short courses were held. The chief purpose was to enrol ex-soldiers (men and women) but civilian applicants were also admitted, provided the requirements of all returned soldiers had already been met.

Date of Com- mence- ment.	Course.	Time (weeks).	Soldiers.		Civilians.		Total.
			Men.	Women.	Men.	Women.	
22/8/45.	Instructors' Course.....	22	19	—	—	—	19
17/9/45.	Farm Engineering.....	3	7	2	2	—	11
25/9/45.	Seed-Potato Course.....	3 days	90 Ex	-soldiers	90	Civilians.	
8/10/45.	Crops and Farm Manage- ment.....	2	19	4	5	—	28
22/10/45	Dairying and Pigs.....	2	30	4	6	2	42
12/11/45	Poultry and Horticulture..	3	21	7	4	7	39
4/3/46..	General Farming.....	8	28	4	—	1	33
6/5/46..	General Farming.....	8	23	—	4	—	27
6/8/46..	General Farming... ..	8	26	3	2	1	32

Instructors' Course.—Sixteen students completed the course and passed the examinations; three students withdrew from the course before it was completed.

In the case of the short course a number of candidates withdrew their applications before the course commenced.

Hostels.—The hostel is being used for the housing of diploma students. The former trainee-settlers' hostel was opened in February 1946 for the housing of short-course students. It is intended to house senior students next year in the second hostel and junior students in the main hostel.

All the vacancies for 1947 have already been filled by ex-servicemen. Four vacancies for ex-servicemen from Rhodesia have been reserved.

Farmers' Day.—The three-day course for seed-potato growers held in September 1945 was most successful and was attended by growers from all four provinces.

Extension Work.

Under the new division of work in the Department, extension work falls under the Division of Soil Conservation and Extension. In spite of this arrangement the services of College officers are still repeatedly being requested for this work. It is regarded as advisable that officers continue to render these services so that contact with the farmer may be maintained.

The following is a summary of the extension work undertaken during the year:—

Lectures	10
No. of farmers present	500
Visits to farms	370
Shows (judged)	1
Congresses attended	5
Committee meetings	12
Days absent on extension work	140
Visitors to College	700
Articles for " <i>Farming in South Africa</i> "	5
Press-Service contributions	3
Other articles	2
Radio talks	7
Letters of advice to farmers	4,000

General Review of Conditions during the Year.

The past year was in many respects a most difficult one for the primary producer. Production was hampered not only by climatic conditions but also by the persistent shortage of fertilizer.

In the case of pigs and even of large stock, farmers were often compelled to market half-grown animals.

The rainfall for the year was 10 inches below normal which represents a serious shortage. In the months of July, August, September, November, April, May and June the precipitation was inadequate, with the result that the expected grass crops for the winter and spring did not provide pasturage.

This low rainfall constituted a threat to the water supply, and consequently recourse had to be had to pump water, and the position remains as critical as ever. Plans are being devised for securing a larger storage of water since an increase in the number of students and in the activities will bring with it an even bigger demand.

Soybeans proved a failure; they did not even break through the soil, since the latter was too dry and hot at planting time. The seed was simply choked in the soil.

The shortage of fertilizer and, mainly nitrogenous fertilizer for pastures had a hampering effect on the carrying capacity of the pastures. In order to ensure increased grain production, a few pastures were ploughed and, in spite of the unfavourable weather conditions, satisfactory crops were harvested at relatively low production costs. Other broken-up lands have again been sown to grass in order to retain the balance of the system. One of the largest maize crops for many years was gathered. One silo was filled with maize and another with grass, whereas in the past few years only grass was used for silage. The policy of planting summer legumes is still being

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pursued and the College has contributed in no small measure towards the expansion of soybean plantings supplying farmers, as it does, with both seed and inoculation material.

The demand for seed by far exceeds the available supplies.

The dry weather had a favourable effect on the potato crop, in that it curbed diseases.

The production of potatoes was sufficiently large to satisfy all requirements, but vegetables were scarce.

Potato prices were satisfactory throughout the year. Seed potato growers also benefited from the allotment of extra fertilizers by the Price Controller.

The veld-hay crop was poor, but each farmer mowed as much as he could. More farmers resorted to the cutting and stooking of maize. They are thus learning from the bitter experience of the drought.

The shortage of bonemeal had a very adverse effect on the growth of young livestock. The low production of dairy cattle is partly due to the poor dipping materials. The so-called blue tick has multiplied and farmers are complaining bitterly of the inadequate supplies of nicotine sulphate. Red water accounted for many deaths and lumpy-skin disease has been reported from many districts in Natal, but fortunately, the disease has not broken out at the institution.

Farmers seem to realize that the heavy type of horse may yet play a more important rôle on small holdings. An increasing number of mares are being brought in for service and the demand for vaccine against horse-sickness, which is most effective, continues to increase.

The herd of the College is still infected with chronic mastitis, but owing to the fact that penicillin is unobtainable, and that the staff has not reached its full complement, very little can be done in the matter.



Field lupins at Cedara.

Low Temperature Research.

Rees Davies, Superintendent of the Low Temperature Research Laboratory, Cape Town.

THE re-organization of the work of the Laboratory to conform to its normal peace-time functions has already been commenced. The process of conversion will of necessity take time as investigations initiated during the war have to be completed, but the weight that is given to the various projects has also changed in some instances and often priority has to be given to new projects rather than to the resumption of work on suspended projects.

The general food position of the Union has changed considerably during the war. Food production has increased very appreciably, but the demand for food has shown an even greater increase. Whilst the demand for food is maintained, the emphasis on preservation for home consumption will be greater than for preservation for transport overseas. Such a change in emphasis must of necessity have repercussions on the investigations into methods of preservation and on the programme adopted by the Laboratory.

The export of fruit, especially citrus, is rapidly being resumed. It is anticipated that the export of deciduous fruit will recover at a slower pace and may not reach pre-war figures for some years. Storage of fruits will thus form part of the Laboratory's programme of investigation as before, and a start has already been made with citrus-wastage investigations. Vegetable production and consumption have increased greatly in the past few years and the need for developing methods of preservation and for wider distribution of fresh vegetables is becoming urgent. Preservation by chilling, freezing and canning offers scope for wider distribution and for lengthening the marketing period.

The shortage of supplies of meat, dairy products and eggs brings with it the need for long-period storage for local consumption and presents new sorts of problems for investigation.

Rapid developments are already taking place in the fishing industry and the potentialities of this industry are large, but the exploitation of all its resources presents many difficulties.

The Laboratory has facilities for investigating many of the problems in processing and preservation that present themselves to the various food industries. Facilities for investigating storage under chilled conditions, for canning and dehydration, and for investigating the physics and engineering problems of transport are readily available, and steps are being taken to implement the facilities now available for the storage of products in the frozen state. A new block was added to the Laboratory building during the war in order to provide facilities for canning and dehydration investigations. A further building has been planned to provide facilities for quick freezing and frozen storage investigations.

The problem of staff is a pressing one. It does not appear that any real relief can be expected for some time as additional personnel with adequate training and experience of research work in this field are practically unobtainable.

LOW TEMPERATURE RESEARCH.

Investigations in Progress.

Dehydration and Canning of Vegetables.

In a fairly comprehensive investigation, comparable samples of various types of vegetables were dehydrated and canned and stored at temperatures ranging from 32°F. to 98°F. The dehydrated product was packed either in air or in inert gases in hermetically sealed tins. The changes in edible and nutritive values during storage have been followed for both the canned and the dehydrated products. The vegetables included in the investigation are green beans, green peas, potatoes, carrots, cauliflower and tomatoes. In several instances variety trials were also incorporated. The storage trials are still in progress for some types of vegetables. It is not possible to present any detailed results here, but the main features of the results can be briefly stated. The canned product proved superior to the comparable dehydrated product in all cases except one—the exception being cauliflower. The dehydrated products in general proved rather disappointing in edible qualities. The losses in nutritive values on storage are complicated by many factors, but it is of interest to record the development of “apparent” Vitamin C in canned green beans after approximately 10 months’ storage. The full results of this investigation will be published in the near future.

Enzyme Tests in Blanched Vegetables.

The testing for enzyme destruction in the blanching of vegetables normally follows certain well defined procedures based on rather arbitrary practices. An attempt has been made to evaluate the significance of these tests for various types of vegetables. A critical study of the tests for peroxidases in green beans and the distribution of the enzymes in the bean tissues, is now in print.

Nutritive Value of Fruits and Vegetables.

A survey of the main nutritive constituents of fruits and vegetables grown in the western Cape-Province, or offered for sale on the Cape Town market, has been in progress for approximately a year. The survey was started with the object of providing much needed information on the effects of variety and season on the nutritive values of the most common types of fruits and vegetables.

The nutrients covered in the survey are Vitamin C and carotene. Particular attention was also given to dry weight. The dried material is stored in order to provide composite samples for analysis of the most important mineral constituents. Varietal influences are considerable but the survey will have to be continued for some time before seasonal influences can be evaluated. It is of interest to note that the Vitamin C values of cabbages are generally of the order of 50 per cent. of those quoted for Britain. It is of further interest to mention that the most popular green bean variety for canning has the lowest Vitamin C content of all green bean varieties. It is anticipated that the survey will have to be continued for several years in order to obtain values that are representative of the most important varieties of fruits and vegetables. Sampling is proving very difficult with some fruits and vegetables, whilst the method of preparation of the samples for analysis needs to be varied in order to obtain true values. The survey has also brought to light several interesting new problems, such as the effect of storage temperature on the retention of Vitamin C in potatoes; these problems are being pursued further.

Fish Spoilage.

As a preliminary to a survey of the condition of fish on the inland markets of the Union, the available methods of assessing spoilage have been tested out. The amount of trimethylamine present in the flesh has proved the most promising, the test being simple and fairly rapid. The examination of the flesh for fluorescence offers possibilities with filleted fish, but is of much less value with whole fish or smoked fillets.

Whilst most of the trawled fish landed at Cape Town is less than four days old and the distribution to the inland markets take place almost entirely under ice in refrigerated railway trucks, the necessity of developing a trade in frozen fish has not received much attention. The survey now planned has as its aim the determination of the extent to which the present system of distribution assures consistently high quality fish for the inland markets.

Dehydrated Fish.

Dehydrated stockfish with a shelf-life of at least a year is now possible. The optimum moisture content to give good keeping quality dehydrated stockfish is in the range 14 to 18 per cent. Stockfish dried to low moisture content, i.e. 5 per cent., has a shelf-life of approximately two months only. Packaging of dehydrated stockfish under CO₂ gives a product slightly superior to that packed under nitrogen. Packaging under CO₂ gives rise to the production of a high vacuum in the can owing to the combination of the CO₂ with amine bases in the dehydrated flesh. It is hoped to test out the demand for the product in the country towns that seldom, if ever, receive fresh fish supplies.

Canned Crawfish.

Heat penetration studies have provided data for sterilizing processes for the industry. It is not possible to use high temperatures for sterilization due to the development of cooked flavours and discoloration. The problem of the development of a blue-gray discoloration in the blood vessels after canning is being investigated, as also the production of struvite crystals in the cans.

Citrus Wastage.

The effectiveness of wrappers impregnated with diphenyl in controlling wastage in citrus fruits under various conditions of storage is being investigated. As it is difficult to interpret the results completely, methods of estimating the actual quantity of diphenyl absorbed by the fruit are therefore being tried out. It is hoped that such data might assist in interpreting the results of storage tests.

Food Yeast.

Following on the investigation of the technique of food-yeast production carried out at the Laboratory some two years ago, the Laboratory provides technical advice to the Food Yeast Development Co. in the operation of its semi-commercial plant at Durban. Considerable progress has been made and the collection of data for full-scale production has virtually been completed.

Farming in the Winter-Rainfall Area.

J. S. Marais, B.A., Ph.D., Principal, Stellenbosch-Elsenburg College of Agriculture, University of Stellenbosch.

DURING the past year a commencement was made with the re-establishment of the normal activities of the Institution. The diploma course was resumed and a series of short courses held. Serious attempts are being made to improve the farms and renovate the equipment of the Institution and so wipe out all traces of the neglect which was inevitable during the war years.

Soil Conservation and Crop Rotation.

A most gratifying feature is the awakening of the farming community to the urgent need for soil erosion control, in consequence of which the work was carried out at an increased tempo during the last winter. Actually the works so far completed, represent only a small portion of what still remains to be done, but nevertheless, a good start has been made. The coming year will probably witness greater activity in this field.

The lucerne-subsidy scheme has not enjoyed the support originally expected. Approximately 5,000 morgen of lucerne were established by 123 landowners, the bulk of the lucerne having been sown in the Caledon-Bredasdorp districts. The particularly unfavourable season was probably a big contributory factor, but was not the sole reason for the lack of interest. Farmers do not seem to be sufficiently alive to the importance of lucerne in a system of rotational cropping, and tend to rely on one or two lucerne paddocks for improving the grazing on their farms.

Climatic Conditions.

Farmers have had to contend with varying climatic conditions. The western Cape Province experienced a particularly dry year and the second half of the summer was exceptionally hot. Nevertheless, the grape harvest was satisfactory, and a good market existed for wine; in fact, it was bigger than ever before. It is felt, however, that the present large-scale production of wine is likely to create marketing difficulties in the near future. Greater attention will have to be paid to the quality of the product in order that the industry may successfully compete abroad.

The excessive rainfall during the first half of the winter of 1945 and the scanty rainfall during spring, are the cause of the poor grain crops. Only in the Swellednam-Heidelberg-Riversdale area, which is normally not regarded as a reliable grain-producing area, were good grain crops produced. In the Caledon-Bredasdorp area, root-rot disease caused extensive damage, and it is estimated that 30 to 40 per cent. of the crop was destroyed by this disease. The donation by the Wheat Control Board of a hot-house, as well as funds for the appointment of additional staff to investigate the disease, is therefore greatly appreciated.

This year the grain crop looks very promising in the Swartland, but is poor in Caledon and Bredasdorp and a failure in Swellendam-Riversdale.

The vegetable industry suffered a severe setback owing to the decreased purchases on the part of the canning factories for canning purposes. Consequently, there was a large surplus of cabbage, cauliflower, turnips, carrots, etc., on the market during the past few months, and many farmers used vegetables of excellent quality

as green feed for their animals because the harvesting and marketing costs were higher than the obtainable prices.

In the field of animal husbandry matters have not been too favourable either. Due to the summer drought, grazing was very limited and lucerne hay and concentrates were extremely scarce. This scarcity affected dairy products in particular. Poultry production decreased considerably owing to the shortage of feed. Many farmers have been compelled to curtail their concerns to a considerable extent.

Prices of horses and mules dropped, owing to the improvement in the fuel position and as soon as tractors and lorries become readily available again, a further drop may be expected. The shortage of labour and the poor quality of farm labour are forcing farmers to apply mechanization, and only the shortage of machinery is delaying a large-scale switch-over.

Education.

The re-opening of the agricultural colleges for the education of prospective farmers has met with great approval. There are 43 first-year students in the Diploma Course, and 11 ex-volunteers attended the 6 months' practical course. Already there are more than 50 applications for admission to the diploma course in 1947, of which a limited number only can be accepted. Plans are, however, being devised for extending the accommodation facilities.

The attendance at the short courses was very satisfactory.

The degree courses in Agriculture and Forestry are being particularly well attended. A striking feature, however, is the unsatisfactory nature of the training given at schools preparatory to these courses. The number of students who fail in the first year is consistently over 50 per cent., and has already been as high as 75 per cent. In 1946, 209 degree-students were enrolled, of which 98 were in the first year, 44 in the second year, 35 in the third year and 17 in the fourth year. There are 15 post-graduate students. In the Department of Forestry, there are 51 registered students. During the past year the following university degrees and diplomas were awarded.

Agriculture: Doctors' degrees 2; Masters' degrees 5, and Baccalaureus degrees 25.

Domestic Science: Baccalaureus degrees 5; Diplomas in Domestic Science 16.

Extension Work.

Much time was devoted to the extension work. About 5,000 requests for information were answered by letter; 75 farmers' meetings were addressed, and attended by approximately 3,000 people. Judging at shows was carried out 44 times, and altogether, 555 farmers were visited, apart from inspections in connection with bacterial blight and the lucerne-subsidy scheme.

Nowadays a good deal of instruction is obtained telephonically and by way of visits by farmers to the Institution. No record is kept of these.

During the past year in particular, a large number of applications have been received for advice in connection with the purchase of farms. Farms are being purchased extensively, particularly by city dwellers, and in most cases uneconomical prices are being paid. Many of the buyers seek advice in connection with their purchases from this Institution. The policy followed is never to state the monetary value of the property, but only to give information in regard to the suitability of farms for the production of various products. An alarming feature, however, is that most farms are being purchased at exorbitant prices.

FARMING IN THE WINTER-RAINFALL AREA.

Résearch.

In all sections of the Institution research is hampered by a shortage of personnel. The education of students dare not be neglected and all applications for information have to be dealt with in full; consequently, the shortage of personnel has an exceedingly adverse effect on research.

Animal Husbandry.

The Animal husbandry section paid particular attention to research in connection with the feeding of locally-produced feeds, in order to supplement the shortage of concentrates. Acorns, oats, silage manufactured from lucerne, lupins and oats, and lucerne grazing, have all been tested out as possible substitutes for mealie meal and protein concentrates. Valuable results have been obtained for practical purposes. In this connection the economic production of baconers received special attention. The baconers were slaughtered, and the carcase measurements taken. At the same time the preparation of bacon was tested out in order to determine the quality of the baconers and the breeding results. Excellent and valuable results were obtained.

Attempts are still being made to develop a new mutton breed in which the virtues of both the Dorset Horn and the German Merino are united and certain defects of both strains eliminated. Satisfactory progress has already been made. The Frisian, Jersey, Percheron and German Merino stud farms have been developed to first-rate concerns. The production from dairy cattle is excellent.

Agronomy.

In the sphere of agronomy, research has been aimed mainly at the development of farming systems which make conservation farming possible. Various systems of rotational cropping are being tested out and the inclusion of dryland lucerne in a system has brought a great improvement.

In co-operation with the plant breeding and plant pathology divisions, breeding and selection work is continually being carried out to obtain improved varieties of cereals, fodder crops and legumes. All these new varieties are tested for quality, resistance to disease and yielding capacity. In addition, an extensive study is being made of the milling and baking qualities of wheat varieties. The breeding results with wheat are hampered by root-rot diseases, especially by *Ophiobolus graminis*, which apparently damages all the existing varieties.

A considerable amount of attention is paid to the influence of manure, straw and various systems of soil cultivation on grain yields. Here too, surprisingly large differences in yields have been observed. Chemists are attempting to find explanations for these phenomena by tracing the processes governing nutrification and those by which plant nutrients are made available in the soil. These results are of great importance for practical purposes.

On the Cape Flats experiment farm, good progress has been made in a study of different vegetable varieties, methods of cultivation, rate of seeding, and spacing. Gradually, information is being obtained which will eventually create order out of the chaos of varieties offered by the trade, and vegetable producers will be able to receive guidance of infinite value. The progress made in the purifying of varieties and in the cultivation of certified seed, indicates that most types of vegetables will soon be independent of imported seed. During the past five years preliminary preparations

have been carried out which will serve as a foundation for future research in connection with vegetables.

Viticultural Oenology.—Studies in connection with fertilization, soil cultivation and variety are being continued, since the results obtained, indicate that the industry can derive great benefit from such studies. Experiments in connection with topping have been discontinued since there is ample evidence that certain methods of topping are outstanding. A series of viticultural experiments has been started in co-operation with the K.W.V. All the vineyards are well established and were pruned, trellised, pre-thinned and tied up by officers of the Institute. Most of the vines have reached the bearing stage and preparations have been made for commencing wine-making, in 1947. It is considered desirable to collect all the various types of wines at the Institute to render possible an accurate study of the quality and the aging of the wine.

In wine-making, further attention was paid to the fortifying of good dry red wine. The blending of Gamay with Pontac and of Mataro with certain other types, is particularly promising. The duration of the vatting period in the making of types of red table-wine, with a view to colour and character, has been investigated, and it appears that an overrated value is attached to long vatting of the husks. In another series of experiments a comparison was made between the settling and non-settling methods in the making of white table-wine. Although the settling method yields a smaller percentage of good wine, it appears that such wine is finer than that made without settling.

Experiments are also being carried out with the making of sweet white wine types (White Port wine). Good progress has been made and promising results have been obtained.

In the laboratory a considerable amount of attention was paid to methods of analysis of wine and brandy and various methods of fining were tested out on a small scale.

The maturing of brandy is being investigated in co-operation with K.W.V. at Stellenbosch and at Robertson. A large number of samples of rebate brandy, spirits and mixtures of the two are being stored and sampled and analysed at fixed periods to investigate the changes in composition due to maturing. All vats are carefully weighed in order to determine the loss in evaporation.

In spite of the comprehensive experiments which are being carried out at present, it is felt that as yet the oenological problems awaiting solution, have been approached only tentatively. The peaceful research atmosphere is lacking, since, due to shortage of personnel, the officers have to perform administrative and routine duties as well as give lectures, besides their research.

Chemistry.

Besides the chemical research which is being carried out in co-operation with the division of Agronomy in connection with experiments on rotational cropping and cultivation, there is a series of projects in which special investigation is being made to determine immobilization of phosphates in various types of soil in the Swartland. Particularly valuable results have been obtained, which indicate that the chemical composition of the available forms of phosphate is an important factor in their value as fertilizer on various types of soil. A study has recently been completed of the availability of nitrogen in a series of organic fertilizers, and the results are being prepared for publication.

FARMING IN THE WINTER-RAINFALL AREA.

Results of great value were obtained in the supplementing of the shortage of manganese on the Cape Flats. Where farmers formerly used up to 40 tons of manure per morgen, it has now been found that 10 to 15 tons of manure are ample if manganese sulphate is added. Vegetable farmers cannot obtain sufficient quantities of manure for their industry and these results are therefore of great economic value, and create the possibility of putting soils which have already become useless, under economical cultivation again.

The use of so-called "starter" solutions was tested out with tomatoes, and it was proved that this method of applying fertilizer yields excellent results. Not only is there a saving in artificial fertilizer accompanied by larger yields, but the crops are accelerated to a considerable extent.

Plant Pathology.

After years of research, a textbook for farmers, on vine diseases, is being compiled, and will soon be ready for publication.

Studies in connection with the control of a leaf-spot disease, roetvlek, in sultanas growing in the irrigation areas along the Orange and Olifants Rivers, which has now made its appearance in Worcester, are being investigated, and the previously unknown causal fungus has been isolated and described. Possible remedies for the control of the disease are being investigated.

A considerable amount of preliminary work must still be carried out before it will be possible to form a clear conception of the organisms contributing to root-rot disease occurring on such a large scale in the grain districts. The fungus *Ophiobolus graminis*, is apparently the main cause, although various species of *Fusarium*, *Helminthosporium sativum* and *Wojnowicia graminis* also play an important rôle. Various experiments are being undertaken for determining the influence of organic matter, artificial fertilizer and soil structure on the damage brought about by the causal organisms. Disinfectants for the control of the disease are being tested.

Meanwhile "root-rot gardens" are being established which serve as a culture base for a large number of wheat varieties and selections which are cultivated with a view to choosing possible resistant selections which may serve as breeding material for resistant varieties.

As can be noticed, this work is still in the commencing stage, and is being performed largely with money made available by the Wheat Industry Control Board.

The investigation into vegetable diseases of which there are a large number requiring attention, is being carried out by only one officer. Among the diseases being investigated are *Rhizoctonia solani* in beans, *Oidium* in musk melons and late squashes, dying off in beans and stem rot in sweet potatoes.

The survey of bacterial blight in vineyards and nurseries is being continued. More than 24 million vines and more than 4 million grafted vines have been inspected. At Somerset West three new infections were diagnosed. Prof. Verwoerd is also the co-ordinating officer for the western Cape Province in the certifying of seed potatoes.

Entomology.

The entomological personnel is totally inadequate for the investigation of the multiplicity of pests about which farmers are continually seeking advice; consequently there is no time for an

uninterrupted thorough investigation of the individual pests. One pest after another undergoes a preliminary investigation until a fairly good insecticide is found, and then another urgent pest has to receive immediate attention.

Nevertheless, a considerable amount of attention is being paid to cutworms, of which *Euxoa subalba* Walk, appears to be the most important. Last February it was found that more than 100,000 cutworms were present on a potato land on the Cape Flats. Bran which is an important ingredient of the best bait thus far used, is unobtainable to-day, and new baits are being tested out.

Surveys of eelworms, *Heterodera marioni*, (Coruu) Goodey, and *Heterodera schachtii*, Schmidt, were made on the Cape Flats. After the tomato crop during the summer of 1944-45, the land was sown to carrots and beetroot in April. The plants were so badly attacked by eelworms, that there was no crop. Immediately after the winter, Long Tom beans were planted, but the infection was slight and when carrots and beetroot were again sown in February, 1946, the crops were damaged so slightly, that a normal stand was obtained.

This peculiar phenomenon is still awaiting an explanation.

Attention has also been given to the control of the Mole Cricket, *Gryllotalpa* sp., the vegetable beetle, *Bagrada hilanis*, Burm; the black beetle, *Heteronychus arator*, Fabr; the tomato caterpillar, *Heliothis armigera*, Hutu; the small tuber moth, *Gnorimoschema operculella*, Zell; the aphid of carrots, *Cavariella capreac*, Fab.; the wheat louse, *Toxiphora graminum*, Rhoud.

Treatments with D.D.T. for the control of house and stable flies, lice on stocks, and fleas were applied with great success.

Plant Breeding.

Apart from the breeding of cereals of which mention has already been made, breeding and selection work is also being carried out with clovers and lupins. Varieties of the latter have been developed, which shows practically no lignification in the seed. Lupins are expected to be a valuable fodder crop and green-manuring crop in orchards and vineyards.

Excellent results were obtained from pure strains of rye developed through self-pollination. Synthesis of commercial rye varieties is necessary in order to make good use of the pure strains.

Extraordinary results are obtained from wheat x agropyrum hybrids and high expectations are cherished from this material for the breeding of types which will be able to resist disease.

Good progress was made in the improvement of various types of vegetables such as Cape Spitzkool, carrots, beetroot, tomatoes and onions.

Poultry Breeding, Dairying and Agricultural Economics.

The technical personnel of the former two sections have had to cope with such a large amount of lecturing and extension work, that there has been little opportunity for any constructive research.

The two officers of the division of Economics could only be of assistance to the Division of Economics and Markets in a study of the production costs of eggs and day-old chicks, and the Farm Book-keeping system. The lecturing takes up the greater portion of their time.

Improving the Fruit Industry.

**R. I. Nel, D.Sc. (Agric.), Acting Director, Western Province
Fruit Research Station, Stellenbosch.**

Perhaps no other branch of farming in the Union felt the impact of the war as acutely and needed more technical assistance and guidance than the deciduous fruit industry. To-day, the Department can pride itself on the services rendered to the industry by the Fruit Research Station during the difficult years of war—a success which is mainly due to the efforts of the first Director of the Institute, Dr. M. S. du Toit, who in August, 1946, was appointed Under-Secretary for Agriculture. Under his constructive administration and inspiring guidance the Fruit Research Station developed not only



View of experiment farm at Bien Donne (W.P. Fruit Research Station)
with strawberry breeding enclosure in foreground.

into a source of practical guidance and technical assistance to the fruit farmer but also into one of the leading institutions of its kind in the world. In the course of the year under review Dr. du Toit, at the instance of the Department, instituted a thorough investigation into the research and marketing problems with which the deciduous fruit industry is confronted in Britain, Canada, Australia and the United States of America, and the industry will benefit greatly from the results of this investigation. The services rendered to the fruit industry and the most important technical activities of the Fruit Research Station are recapitulated below.

Enlightenment and Technical Advice.

New milestones have been reached in the sphere of providing practical enlightenment and technical advice not only to farmers but also to factories and bodies interested in the fruit industry. In addition to a big farmers' day on the experiment farm, Bienne Donne, which was opened by the Minister of Agriculture and attended by about 600 fruit farmers, smaller farmers' days were held at Villiersdorp, De Doorns and Joubertina, and a short course in pomology was held at the Stellenbosch-Elsenburg College of Agri-

culture. Further, 110 farmers' meetings, attended by 2,571 fruit-growers, were addressed. The laboratories, offices and experiment farms were visited by 1,627 interested persons. Not only was much information supplied per telephone but a large number of advisory letters were also written to farmers. As reflected by the total of 2,659 farms visited during the year there was an exceptionally keen demand for the investigation of cultural and other practical farming problems, especially on the part of new farm-owners. There remains, however, a considerable need for specialized enlightenment in the outlying districts both as regards problems of quality and cultural difficulties, which could not yet be met.

As in the past much time was devoted to technical advice to the Deciduous and Dried Fruit Control Boards and their committees, *inter alia*, on matters such as grading, packing, transportation, storage and marketing problems. The meetings held by these bodies were always attended by a member of this Institution.

Technical advice was once again given on a considerable scale to canning and dehydration factories, packers of dried fruits, manufacturers of sprays and dusting materials for which purpose investigation and experiments are being carried out.

Assistance to other Divisions and Departments includes, *inter alia*, 3,172 notices issued and 270 letters written on behalf of the Controller of Fertilizers; approval of bulls and inspection of potatoes in the Ceres-Tulbagh, Worcester-Robertson areas for the Division of Soil Conservation and Extension, a survey of the mineral and vitamin A and C contents of vegetables in the Knysna area for the local Health Centre and spectro-chemical analyses for the Division of Horticulture.

Co-operative Demonstration Experiments.

Experiments on farms are regarded as the best method of demonstrating the applicability of a cultural practice or the suitability of a variety for a certain area. In all, there are 143 co-operative experiments under way in connection with the following subjects: rootstock types for deciduous fruit varieties; suitability of areas for varieties of deciduous, sub-tropical and berry fruits; orchard practices such as pruning, thinning, grafting, etc., vine rootstocks and varieties, spraying against delayed foliation, hormone sprays against drop of apples; control of manganese and zinc deficiency and chlorosis in various tree and berry fruits; control of fuscladium and peach mildew; control of calandra, woolly aphids, ants, fig scale, codling-moth in apricots, codling-moth spraying experiments and leaf-scald in apples, biological and chemo-biological control of codling-moth infestation (parasite cum spraying method), irrigation and drainage, reclamation of brackish soil and packing and storage of dried fruit.

Although a considerable number of experiments are already being conducted outside the better-known fruit areas, *inter alia*, in Clanwilliam, Van Rhynsdorp, Ladismith, Barrydale, Swellendam, Uniondale, Stanford-Napier, etc., there are still many centres awaiting such experimentation.

Research.

Climatic Studies.—With the recently completed improvements, the Institute has now at its disposal an exceptionally well-equipped meteorological observatory with good facilities for agro-meteorological research. A basic part of the work comprises the making of detailed climatological observations at the central observatory and also the collection of meteorological data at 12 sub-stations in the leading

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fruit areas. A report on these data is written annually and is at the disposal of other Divisions as well. The practical advantages of the survey and classification of the fruit-producing areas include the recommendation with much more certainty of the most suitable varieties for a specific locality, the elimination of climatically unsuitable and consequently, unprofitable varieties, the timely application of measures against delayed foliation, facilitation of the application of spraying programmes at the proper time, etc. Problems to which special attention was paid during the past few years were, *inter alia*, summer climate in its relation to cultivation and quality of deciduous fruit and the effect of winter temperatures on fruit production.



Portion of the vineyard fertilizing experiments at Bien Donne, Groot Drakenstein (W.P. Fruit Research Station.)

Pomological Investigations.

From a pomological point of view the problem of climatic unsuitability of varieties as revealed in the phenomenon known as delayed foliation is approached mainly along three lines, viz. (1) the application of direct measures of control on existing plantations; (2) the testing of varieties for determining their resistance to delayed foliation; and (3) the investigation of methods for replacing undesirable varieties by more suitable varieties.

Control of Delayed Foliation.

The effect of the time of pruning on delayed foliation was investigated for the fourth season in Peregrine and Early Dawn peaches. Late pruning again induced a 100 per cent. increase in yield as compared with early pruning. A further series of experiments were laid out in connection with oil sprays against delayed foliation in prunes, apples and pears, mainly with a view to establishing the most suitable time of application and the usefulness of adding di-nitro-cresol to the oil emulsions.

Varietal Studies.

(a) *Deciduous Fruits*.—The variety trial orchards at Bien Donne which comprise more than 300 peach, pear and plum varieties and

include new selections as well as newly-imported types and standard varieties under cultivation, are making excellent progress. The peach trees should bear a reasonable initial crop this year. Once more there was a heavy demand for the mid-season desert peach "Boland" which was issued by the Institute last year. This variety is exceptionally resistant to delayed foliation.

(b) *Sub-tropical Fruits*.—Of the various sub-tropical species and varieties of fruit which are being tested at the experiment farm and in the outlying districts, the avocado, guava, fig, olive and pecan nut seem to offer the best prospects. Regular notes are made on yield, ripening season and quality.

(c) *Berry Fruits*.—As a result of the growing interest in berries, the experimental work has been considerably expanded. Experiment plots have been laid out in the Koue Bokkeveld, Ceres, Elgin, Houwhoek, Napier, Wellington and Stellenbosch, where several varieties of strawberries and brambles are tested. On the experiment farm, Bien Donne, various cultural methods are being tested. So far, results from the extensive bramble experiments seem to indicate that the thornless Young-berry produces the highest and the Low-berry the lowest yields, whereas the Boysen-berry appears to possess the highest commercial factory value. Extensive experimental work on Gooseberries was conducted at Bien Donne. The ordinary Cape Gooseberry (*Physalis peruviana*) appears to be superior in all respects to *Physalis ixocarpa* which is also being cultivated in certain parts of the country. A new type, *Physalis pubescens*, has also been planted. Since there are no standard varieties or selections of the Cape Gooseberry, notes on individual plants are made with a view to a selection of the best types.

Experiments with Top-working and Rootstock Types.

The results of three co-operative experiments in which 7 to 8 methods of top-working of apples and pears were compared show that, while stub-grafting is the most expensive method (viz. 2s. to 5s. per tree, according to size), it is, nevertheless, the most economic method because of its early crop and high yield. These findings are especially important to growers who wish to replace unprofitable varieties by more remunerative varieties.

The experiments on the testing of rootstocks are progressing favourably. The mother plantation is now being transferred from the University farm "Welgevallen" to Groot Drakenstein and for the next two years experimental work will necessarily have to be conducted on a limited scale. Pruning tests are being continued and new pruning demonstration plots have been laid out. Experiments on the pollination of pears have once again been resumed.

Cultivation of Table Grapes.

Ampelographic Work.—The detailed studies on the growth, cultivation and production of the 16 more important commercial varieties were continued. In addition, comparative studies including the quality and marketability as well as growth and bearing characteristics were again conducted on about 150 table grape varieties in the ampelographic collection.

Pruning and Topping Experiments.—The experiments on the time of pruning of Waltham Cross grapes have now been concluded after the sixth season, and the results are being prepared for publication. In Red Muscadel the results obtained over a period of five years show that clearing followed by a final pruning in August is the best treatment and that the time of ripening is largely determined by the time of the final pruning rather than that of the clearing. In Red

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Hanepoot, preliminary experiments show that a clearing and final pruning should be performed simultaneously during the second half of August and long-bearers be left with the necessary short ones without bending the shoots. In a five-year topping experiment with Alphonse Lavallée, tipping proved the most beneficial treatment as compared with severe and moderate topping—a practice which is especially recommended in the case of the verandah trellis.



Fumigation of grapes with sulphur dioxide in the truck. Grapes treated in this way arrived at inland markets in prime condition.

Shoot Growth and Thinning of Bunches.

Studies on the growth of the grape vine were continued with special reference to periodicity of shoot growth, time of budding and blossoming of varieties and increase in volume in the developing grape bunch. In addition, considerable attention was given to the question of poor fertilization in Waltham Cross, one of the most serious problems confronting the Paarl table-grape grower.

In experiments on the most suitable time for thinning of surplus bunches, thinning prior to the blossoming period proved most beneficial in the case of White Hanepoot, and may mean an additional income of almost £14 per morgen to the farmer. The experiments yielded most interesting data on the various methods of thinning bunches and producing grapes of superior quality.

In experiments on top working of vines (Gros Colmar) to new species (Alphonse Lavallée) cleft grafting in which 91.6 per cent. of the scions took, proved far superior to the Jardine method and tongue grafting.

Progress in Breeding.

In the case of almost every kind of fruit there is no need for varieties which are better adapted to specific climatic regions, more resistant to specific diseases, and which mature either earlier or later and have a better keeping quality than the types available. The question of better quality virtually constitutes one of the most acute problems in the reconstruction of the fruit industry. This year attention was focussed mainly on guavas and extensive observations were made on quantitative and qualitative properties in about 5,000 individual hybrid trees raised from seed. In the case of strawberries

similar data are being collected from 5,000 hybrids, and a further 1,000 crosses have been planted out. In the case of peaches 50 new crosses have been planted out, but in the case of grapes and apples no new crosses were made. Hundreds of hybrids from previous crosses of these fruits are under observation.

Physiological Investigations.

Premature drop of apples near harvesting time presents an important problem in the Elgin area and experiments were continued on the efficiency of hormone sprays in preventing drop. Alpha-naphthalene acetic acid and certain hormone sprays gave satisfactory results. In the experiments as much as 20 per cent, sound fruit, which would normally have been blown off, was saved. This rendered the spraying quite profitable.

Extensive experiments are under way in connection with the nutritional requirements of various fruits. Special attention is being paid to deficiencies of manganese and zinc and to methods by which the condition can be remedied. No symptoms indicative of malnutrition have so far been definitely determined for guavas. Sand cultures are used for these determinations.

Experiments are under way in connection with root development in olive slips when treated with hormones.

Investigations of Plant Nutrition, and Soil Fertility.

Spectro-chemical investigation of nutritional deficiencies.—As a result of the comprehensive nature of the results and the accuracy and greater speed and facility with which determinations can be made, spectro-chemical analysis is being increasingly employed in determining nutritional deficiencies in plants. Specific methods entailing considerable pure spectro-chemical research have been devised for this purpose and the Institute is in the vanguard in the application of this method for agricultural purposes.

Apart from routine analyses in connection with physiological experimental projects and samples submitted by farmers for diagnosis, an extensive study was made of the change in concentration of elements in the vine leaf during the growing season on the basis of samples from various fertilizer plots. The results of the first year show that: (a) manganese concentrations remain constant; (b) potassium, phosphorus and magnesium decrease; (c) aluminium, iron and calcium increase considerably; and (d) concentrations of boron vary and show no definite tendency.

Fertilizer Experiments.—Owing to the resignation of the officer responsible for the fertilizer experiments, the work was considerably retarded and some experiments, e.g. those on apples, had to be temporarily discontinued. The experiments on berries, prunes and grapes yielded most interesting results but final conclusions will only be possible in a few years' time. A noteworthy result is the exceptionally strong response of orchard cover crops to nitrogen applications and, to a lesser extent, to phosphate; this finding is of great importance in connection with soil conservation and throws into relief still further the difficulties in respect of artificial fertilizer at present experienced by fruit and grape-farmers.

Irrigation and Moisture Conservation Experiments.

The vines specially planted for these experiments have now reached an age where the actual irrigation experiments can be commenced. Uniformity experiments in which the thickness and weight of shoots and the yield of individual vines were taken, have already been carried out by way of preparation. In consequence of the shortage

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of staff due to resignations, fundamental studies on the moisture requirements of fruit trees, conservation methods, etc., have had to be discontinued until conditions improve. This is most unfortunate, since irrigation is of basic importance in fruit production and plays an important rôle in the wintering of trees, yield, grade and quality of fruit. The brack or alkaline problem, too, should receive more attention.

Investigation on Picking, Storage and Transport of Fruit.

Comprehensive studies were again conducted in connection with the factors influencing the standard and keeping quality of the various kinds of fruit and the best treatments for ensuring a long storage life.

Apples.—The bio-chemical changes in the fruit during its development in the orchard, the influence of climatic conditions and the stage of picking have been determined for the most important commercial varieties, especially with a view to the present storage difficulties which result in considerable annual losses. In consequence of these studies, "bitterpit" graphs have been plotted and with the aid of these the possible susceptibility to bitterpit can be predicted as early as January. An important finding is that, in practice, farmers pick from 4 to 6 weeks too early and that in consequence, a 20 per cent. loss in weight, pronounced susceptibility to bitterpit and scald, shrinkage and loss of colour, aroma and taste result during storage or marketing. Apples picked at the right time can be stored in perfect condition for very long periods, at low temperatures (31° to 30° F.).

Pears.—Similar experiments were conducted this year with Bon Chretien and Packham's Triumph, with this difference, however, that the influence on canning qualities also constituted part of the experiments. During the fortnight preceding picking, the weight increases by about 30 per cent., and thus if pears are harvested at too immature a stage a serious loss may be experienced. Apart from storage temperature, ripening temperature is also an important factor. Whereas these pear varieties ripen unevenly at higher ripening temperatures and become watery and tasteless, they develop a high quality at 55° F. and retain their eating and canning qualities for a relatively long period.

Grapes.—In view of the high losses from wastage in grapes on the local market, detailed investigational work was carried out (a) to determine the factors and conditions causing this wastage and (b) to develop methods, such as gas treatment, for its control. In this connection officers of the Institute travelled in fruit trains to Durban and Johannesburg and studied conditions in trucks of various types. In addition, they investigated specific marketing difficulties and complaints.

In continuation of previous experiments on the control of wastage by the spraying of wood wool with a solution of sodium bi-sulphite and exposure to sulphur dioxide gas, methods were developed for successfully treating trucks of packed grapes under relatively high temperatures, with sulphur dioxide gas. In this manner the gassing of large consignments by these methods resulted in an effective control of wastage and a remarkable lengthening of the period of marketability. In other experiments where grapes, after an exposure to gas or spray, were held in cold storage at 31° F. and again treated periodically, the fruit was kept in a very satisfactory condition for 4 to 5 months. These out-of-season grapes fetched exceptionally high prices on the Johannesburg market. These experiments are, from a practical point of view, of the utmost significance to the grape-farmer.

Entomological Investigations.

(1) *Codling Moth*.—Owing to a cool autumn and an improvement in spray supplies, a far more satisfactory control of the pest was obtained on both apples and pears, than during the previous year, in spite of the fact that the crop was very light, particularly in the case of pears. As regards apricots, too, the position was more favourable, partly in consequence of the increasing practice of spraying with fixed nicotine. During the past season, infestation of prunes was once again very severe in the Tulbagh area. In the meantime it has been definitely established that the fruit is attacked by a predominantly one-generation strain of the pest, as in the case of apricots—a fact which will facilitate control.

The long-term spraying experiment to control the codling moth and spray injury in apples, was continued. Arsenate of lead again induced considerable leaf scald and leaf drop. Oil injury began to show up, indicating that the continued use of summer oil emulsions on apples, definitely holds some danger. The special advantages which spray programmes with fixed nicotine offer to apple growers, were once again evident. A spray programme including cryolite, gave most promising results. Two proprietary brands of fixed nicotine were tested out against each other on pears and a preliminary test was carried out with a new organic spray containing benzene hexachloride.

Control experiments were continued on apricots with sprays and dusts including materials containing the insecticides D.D.T. and benzene hexachloride. The results indicate that dusting can apparently be successfully applied against codling moth on apricots—a finding of great practical significance in the drier areas—and that D.D.T. is promising both as a spray and as a dust. The replacement of fixed nicotine by D.D.T. can, however, not be recommended as yet.

Moth control experiments in prunes have been commenced.

Biological Control of Codling Moth.—This project received considerable attention and made good progress. At the beginning of the year under review it became possible to occupy the parasite laboratory partially and to expand the breeding of parasites considerably. The false codling moth is still mainly used as host, and more than seven million of these insects have been bred. The methods developed by the Institute have aroused keen interest overseas and institutes in California and Australia have asked for full particulars. A visiting entomologist from England requested permission to send out a technician shortly to receive special instruction in our methods. Trouble is still being experienced with the mass breeding of certain specific parasites and with the acquirement of desirable parasites from abroad.

Parasite liberations were extended and experiments with the parasite cum spray method were repeated. With 3 to 4 sprays of fixed nicotine plus the employment of parasites, infestations of 12.4 per cent. (Nieuwedorp experiment) and 26.1 per cent. (Rhone experiment) were obtained, as against infestations of 15 per cent. to 50 per cent. in adjoining orchards where the full spray programme with fixed nicotine and summer oil emulsions (9 to 10 sprays) was carried out. These results are regarded as most promising.

Other Orchard Pests.—The activities of other orchard pests, such as the fruit nibbler, the pear bud mite, scale insects, the *Bryobia* mite, woolly aphis in apples, etc., were carried out on a normal scale. Black peach aphids, however, occurred on an exceptionally severe scale in September and October 1945 and more often than not control measures could not be applied because of lack of nicotine sulphate.

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Considerable damage was caused. Mediterranean and Natal fruit flies were very active too and caused considerable damage, especially in grapes. Owing to the shortage of white sugar, which is recommended for the preparation of the poison bait, control was seriously hampered. Preliminary studies on various olive pests were carried out and control measures tested out.

Vine Pests.—Mealy bug infestations occurred on an exceptionally light scale, partly as a result of unfavourable weather conditions and partly as a result of intensive ant control campaigns, which were generally initiated. Other vine pests, with the exception of the fruit fly already mentioned, occurred on a normal scale, or to a lesser extent than during the previous year and did not result in much damage in those cases where proper control measures were applied.

Laboratory Studies.—Considerable attention was given to insecticides and toxicological studies. New directions of study include the effect of insecticides on the natural enemies of pests and of the factors which may render selective use of insecticides possible. The experiments included, *inter alia*, the testing of the relative toxicity of a series of insecticides against one of the codling moth parasites. In addition, a comparative study was made of the pH of the digestive juices and the enzyme contents of the gastric juices of the codling moth, of the false codling moth and of certain parasites, with the ultimate aim of developing poisons injurious to the pest but harmless or less injurious to its natural enemies. Important results have been obtained. In addition, conventional toxicological experiments were carried out on a series of insect pests in which the newest insecticides were tested. This work is being continued.

Other studies included the biological forms of the pear mite, *Eriophyes piri*, morphological differences between the larvae of the codling moth and false codling moth, and treatments in connection with the keeping qualities of host larvae in parasite breeding.

Diseases in Orchards and Vineyards.

Owing to the serious shortage of staff, the plant pathological work had to be reduced to a minimum. Intended new research work on scab in apples (*Venturia inaequalis*) had to be dropped. Spray programmes, which fit in with those used against the codling moth, have been devised and a detailed report on the investigations to date has been drafted.

Peach mildew (*Oidium leucoconium*) is still viewed in a most serious light and research has been continued. Experiments again revealed that the occurrence of the disease on the fruit itself can be avoided by the application of a lime-sulphur spray in winter. This treatment is not effective against the disease on young shoots, even when followed by various summer sprays with lime-sulphur. A di-nitro-cresylate spray yielded no significantly better results than lime-sulphur. Summer treatments are essential for the control of the disease on leaves and sulphur dustings yielded much better results than lime-sulphur sprays. The investigation of bacterial blight in vines (*Erwinia vitivora*) which had been temporarily discontinued, was recently resumed. The long-term experiment on the susceptibility of varieties at Constantia had to be laid out anew. When lifting the old experimental vines, it was established that although the aerial parts (six years after planting) did not reveal any symptoms of infestation, the Jacques rootstocks on which the vines were grafted, were heavily infested. The bacterial blight organism was isolated from the soil and also from old prunings from the previous year and consequently the disease should in future be viewed in a more serious light.

Studies on Fruit and Vegetable Preservation.

The expansion of the preserving industry during the past few years gave prominence to many problems demanding investigation on an extensive scale. This work was seriously hampered by lack of staff as well as by continual changes in the staff. During the past three years the Institute lost no less than 7 officers, who were absorbed mainly by the food technicological industry at a stage when they had just gained useful experience and were beginning to render most profitable service. Investigation was nevertheless carried on and both growers and the industry could be given valuable advice.

Guavas.—More than 4,000 vitamin C determinations were made on new guava crosses and selections and, in addition, determinations were made of moisture and of ratios of rind to pips and to flesh. Chemical investigations of carbohydrate in this fruit were continued and the data indicate the absence of Sorbitol.

Plums.—A detailed study was made of the chemical composition of and pectin changes in Satsuma, Methley and Santa Rosa varieties, particularly with a view to determining whether the gel properties of the latter two varieties could be so improved that jam factories could utilize the fruit on a more extensive scale. Further, the suitability of varieties such as Billington, Gaviota, October Purple, Wilson, Eclipse, Venus and Navrabeen for canning and the making of jam was investigated and also the suitability of prune varieties for preservation in various forms.

Pears.—In continuance of the project with pears, in connection with the influence of climate, variety, stage of picking, storage and ripening temperatures and gas treatments on quality and keeping property, the effect of the same factors on the canning life and quality was studied. For this purpose about 4,000 tins of pears were canned: the investigations are being continued.

Other Fruits, etc.—The suitability of strawberries and fig varieties was tested for various forms of preservation. In addition to a series of determinations on the quality and value of certain imported dehydrated products, an investigation necessitating about 400 chemical determinations was carried out to determine the nutritional value of various kinds of dried fruit according to grade.

Vegetables.—The work on the methods of preparation, pre-treatments and suitability of vegetable varieties for various preservation processes was continued. Special attention was given to the following: sweet potato (24 varieties), carrots (17 varieties), peas (6 varieties) and sweet corn (27 varieties). In the survey of the mineral and vitamin A and C contents of vegetables carried out in the Knysna area, the low potash content was particularly striking.

Experiment Farms.

The experiment farms were maintained and developed to the extent permitted by the available funds.

At *Bien Donne* considerable lengths of irrigation furrow were completed and the irrigation system was generally improved. The development of the 80 morgen of the high-lying ground which will now also be placed under irrigation, was continued. Experimental plantings were extended and preparations made for an expansion of the nurseries. The extensions to the meteorological observatory were completed and additional houses built for labourers.

At the *Paarl* Experiment Station, the main improvement consisted in the removal of granite blocks from ground which will be utilized for a trellising experiment.

Dehydration and Cold Storage of Food Products.

G. M. Dreosti, M.Sc. Ph.D., Officer in Charge, Dehydration and Cold Storage Laboratory.

THE functions of the laboratory are to conduct industrial investigations and to render direct scientific and technical assistance along practicable lines to the food industries generally. All food processes are included in the scope of the work, particularly dehydration, canning, the extraction of fruit juices and concentrates, and refrigeration. The work covers food products such as vegetables, fruit cereals, meat, fish, oils and fats, eggs, dairy products and even such products as chicory, tobacco, etc.

During the war years, the laboratory developed a vegetable dehydration industry in the Union and not only evolved almost all of the equipment and processes used in the factories, but also controlled the industry in all its aspects, including the allocation of official contracts. Direct and detailed assistance was given to the factories, and also to the Rhodesian Government, in the establishment of their plants and techniques.

All raw materials, operations at the factories, and final products were closely inspected in order to ensure that only the best products were delivered to the Admiralty to whom most of the products were supplied. The dehydrated products and packaging were of a very high standard.

The functions of the laboratory also include the technical control of cold stores, and consequently regular inspections are undertaken in terms of the Livestock and Meat Industries Act, (No. 48 of 1934). From time to time the meat and egg stocks of the Director of Food Supplies and Distribution have been inspected in accordance with the usual practice during the war, and technical assistance has been rendered in regard to the stacking and optimum conditions of storage of these commodities, and also in regard to the routine testing of egg fillers and the supervision of the cleaning and fumigation of the cold stores.

The laboratory also has a representative on the local Price Control Committee and on the National Supplies Control Committee.

The work of the laboratory was conducted under great difficulties, not only as a result of the lack of adequate special equipment, which still remains extremely difficult to secure, but also owing to the continual changes of temporary staff due to resignations. During the year there were no fewer than 23 resignations.

Unfortunately, the whole of the original staff of relatively senior officers has now left the laboratory, and under the circumstances it is most difficult to pursue effectively even the major projects on hand.

In July 1945 the Officer-in-Charge proceeded overseas for a period of nine months and visited the United Kingdom, Germany, Canada, United States of America, Hawaii, New Zealand, Australia and Malaya in connection with the scientific, industrial and economic aspects of food dehydration, cold storage and transport, quick freezing, canning, fruit and vegetable juices, citrus concentrates, drying of chicory, grain and tobacco, forest products, and the processing of agricultural raw materials generally.

A special study was also undertaken in regard to the organization of scientific and technical research in the field of food process-

ing and preservation. Altogether 279 organizations were visited, including 137 factories and 65 laboratories. A mass of useful and important information was secured concerning new industrial processes, equipment and techniques, and modern research developments and trends.

Dehydrated Vegetables.

As a result of the sudden conclusion of hostilities and the falling away of large Admiralty and other official contracts, the industry is now in the critical stage, anticipated by the Department some years ago, of transition from a war- to a peace-time footing.

Detailed assistance is given to the factories on the basis of laboratory investigations, particularly in regard to the modification of the products and the development of new products and packaging to explore other avenues of disposal.

Production.—Complete records of production, deliveries, tinplate requirements, prices paid for raw materials, processing and packaging, yields and trimming losses, etc., are maintained.

The total production of dehydrated vegetables in the Union during the year was 537·6 tons, as compared with 672·8 tons for the preceding 12 months. The main commodities produced were carrots, cabbage, onions and potatoes, and smaller quantities of green beans, green peas, cauliflower, beetroot, turnips, etc. Only 214 tons were delivered to the Admiralty as compared with 591 tons during the preceding 12 months, the remainder having been largely converted to soup mixtures. The total production of soup mix was over 1,800 tons as compared with 490 tons during the preceding year. These totals include the delivery of 1,000 tons to the British Ministry of Food and to Red Cross organizations.

Inspection.—Supervision is exercised over the purchase of raw material, washing, peeling, blanching, equipment and chemicals used and the maintenance of solutions, tray and detraying, dehydration processes, temperatures, humidities and drying times, bin drying, packaging, soldering, lime packing, gas packing and boxing, by the laboratory inspectors stationed at the factories.

Samples of the products are drawn and analysed in the laboratory for moisture content, peroxidase activity, sulphur dioxide content, culinary qualities (colour, flavour and texture), air-tightness of tins and effectiveness of gas and lime packing. Bacteriological investigations have also been conducted. The amount of work involved in routine inspection may be gauged by the fact that during the year about 1,000 samples of dehydrated vegetables were submitted to detailed culinary tests for flavour, colour, texture and structure. No less than 5,000 routine moisture determinations were made in duplicate by means of the laboratory vacuum ovens.

Over 3,000 samples were tested for peroxidase activity and over 2,000 were analysed for sulphur dioxide content. New methods of estimating peroxidase activity were tried, but the guaiacol-hydrogen peroxide method was retained. Similarly, the Monier Williams method has been retained after all quicker methods were found by critical test to be insufficiently accurate.

In view of the results of previous years and the pressure of more urgent work, routine Vitamin C determinations were suspended and only random analyses were made; nevertheless, a total of over 200 Vitamin C determinations were made, mostly in regard to storage trials. Mapson's method for eliminating apparent Vitamin C has been adopted for routine work. For Vitamin A and carotene the Evelyn photoelectric colorimeter is used.

Approximately 4,000 leaker tests and gas analyses were performed, the latter by means of a modified Ambler apparatus. Gas packing at the factories is performed by the displacement method evolved in this laboratory, which has proved extremely reliable and effective. The oxygen content varied between 0.2 per cent. and 0.8 per cent., with a gross average of 0.45 per cent. for the whole year's production, including soup mixtures which were more difficult to gas-pack than dehydrated vegetables in the form of strips and dice.

These figures include the determinations made at the sub-stations in Johannesburg, Barclay Vale, Ficksburg and Wellington.

Cooking instructions were worked out for a number of South African products and made available to the factories for attaching to their labels, and all new labels were scrutinized prior to use. All new recipes for soup mixtures were also scrutinized and tested, and factories were permitted to manufacture approved soup mixtures only.

As it is considered that sufficient detailed guidance has now been given to the industry and that compulsory supervision and inspection are no longer essential, it has been decided to place the inspection of factories and products on a voluntary basis. This will not, however, affect the degree of assistance which will be given where needed.

Lime Packing.—During the year all vegetables delivered to the Admiralty for use in adverse tropical climates were lime-packed to reduce the moisture content to extremely low levels, the lime being encased in composite containers inserted in the tins.

The method was applied after a complete investigation of different South African limes had been made, and after development of suitable quantitative inserts in the laboratory, and modified gas-packing technique.

In collaboration with the manufacturers, the available CaO of the best South African lime tested was increased from 60-70 per cent. to 75-80 per cent. Similarly, the purity of the nitrogen used for gas-packing was, in collaboration with the manufacturers, increased from 0.8 per cent. oxygen to 0.2 per cent. oxygen.

Dehydration Investigations.

A large number of tests were made in connection with problems of immediate practical importance at the factories. It is impossible to describe all the work in detail, and only a few of the results selected at random from the records are indicated below.

Preparation.—For civilian purposes where the reduction of bulk is not as important as for war purposes, sliced dehydrated root vegetables are more attractive than strips or dice, except possibly in the case of turnips, and a thickness of $\frac{1}{8}$ in. is the most satisfactory. Preparation and drying times and costs are similar to those for strips and dice. A short pre-cook of 3 minutes reduced peeling losses by half and the trimming time by 15 per cent. Peas which were stored in the unshelled state for 12 hours at the factories yielded better products than shelled peas even when stored under water.

As an indication of the effect of sodium sulphite on the blanching time required for inactivating enzymes, it may be mentioned that for green beans the time was reduced from 10 minutes for water to 3 minutes for a 0.2 per cent. sulphite solution, quite apart from the improvement in the product, which was also superior to the steam-blanching articles. Where steam-blanching was practised, it was

found better to omit the subsequent cold water dip. Critical comparisons of water-blanching and steam-blanching for different vegetables have been continued. The variation in packing density which is possible from blanching differences alone, may be indicated by the fact that a 20 per cent. higher density can be obtained for steam-blanching than for water-blanching carrot strips.

Better colour was retained in the dehydration of beetroot when the blanched products were allowed to cool in concentrated blanching liquid prior to draining than when drained and spread on the trays immediately after removal from the blancher.

The keeping quality of under-blanching potatoes was generally only slightly inferior to that of the best products which were blanched in sulphite solution, the only significant differences being in respect of colour. Sulphite blanching of carrots yielded products definitely superior to those blanched in water, particularly as regards colour and flavour.

During investigations with strong sucrose blanching solutions, an interference with the guaiacol-hydrogen peroxide test was discovered, with an "apparent protective" influence. Investigations are in progress to attempt to discover the mechanism of this effect, which is absent when inactivated potatoes are used and even when active crude peroxidase is blanched in strong sucrose solution. The effect was absent with glucose solutions.

An interesting discovery with glucose is the fact that by its addition to the blanching solution in small quantities the reconstitution value of the dehydrated vegetables is appreciably increased. This important discovery is being followed up, also with other solutes as the imperfect reconstitution of dehydrated vegetables generally is considered to be one of the main defects of these products.

Sealing of Tins.—Investigations are in progress in regard to the sealing of tins with press-in lids. A special crimper has been designed whereby these lids can readily be made to close almost airtight. The principles underlying the method are being fully investigated, particularly with a view to the possibility of incorporating re-closure features.

Investigations are also in progress in connection with the practical application of a special sealing compound which promises to be ideal as a seam dope.

Gas-packing.—A rapid method of gas analysis, based on the absorption of oxygen by copper in ammonia, was evolved for factory use and applied in practice. The rates and times of flow of gas required, when the industrial gas-packing equipment evolved in the laboratory is used, were worked out for a number of new commodities.

Compression.—Investigations on the compression of dehydrated vegetables have been continued, both with and without the use of certain binders, particular attention being given to green beans, onions, cauliflower, cabbage, carrots, beetroot and potatoes. For instance, after blanching in a glucose solution it was possible to compress all the vegetables tested, except potatoes, into firm blocks without any need for the usual moistening of the product and re-drying of the block after compression, with the attendant losses of SO_2 content and Vitamin C.

Storage.—Various kinds of available non-metal moisture-proof containers were investigated for the storage and transport of dehydrated vegetables, but none was found to be adequately vapour tight.

Factory managers were therefore advised that in the event of their desiring to use non-metal packages, these should be packed into hermetically sealed 4-gallon squares for wholesale distribution, with an advice to the retailer, pasted over the lid, that only as many packages should be removed as could be sold within one week or less, and with an advice on the packet to the consumer that the contents should be used within one month of purchase.

Mashed Vegetables.—As the potato is extensively consumed in the mashed state, it is considered that dehydrated potato mash and potato mash powder will probably find a much greater demand than strips or even slices. Laboratory investigations have shown that a satisfactory and economic procedure for existing dehydration factories, is to cook the peeled potatoes fully in a 0·1 per cent. sodium sulphite solution, mash with the addition of 1 per cent. salt, subdivide by forcing through orifices, e.g. by means of a roller-sieve device, load to $\frac{3}{4}$ in. density, and dehydrate.

Dehydration in the trolley-tunnel drier occurs rapidly; e.g. within 2 hours the moisture content is under 5·5 per cent. The resultant product reconstitutes very readily into a good mash—in fact better than any overseas mashed potato powders tested—by the addition of hot water, allowing to stand for 5 minutes, and mashing. The use of dehydrated mashed potato should prove an excellent way of incorporating potato in dehydrated soup mixtures, and experiments are also in progress in connection with the making of other mashed dehydrated vegetables in the form of strings and tablets.

Potato-mash Powder.—A great future is anticipated for this commodity in the United Kingdom and the United States of America, and it may find a fair demand in South Africa. Special equipment and techniques, some of which are patented, are required for producing this product. A special plant for the application of the Cambridge spray method is being manufactured and will probably be in operation in the Union early in 1947. This will be the first plant of its type in existence.

The laboratory is endeavouring to evolve an alternative, simpler and cheaper method for which as much as possible of the existing plant at factories in the Union can be utilized. The result of the preliminary investigations seem promising.

Puffed Potatoes.—The immersion of dehydrated potatoes, which have been blanched in relatively strong brine, in hot oil for a few seconds, results in their becoming puffed to form a light, crisp and tasty snack. The factories have been advised and assisted in applying the technique evolved in the laboratory, and the product has recently been placed on the South African market. The required dip ranges from 4 seconds to 15 seconds in oil at temperatures varying between 270° F. and 210° F. respectively. The oil absorption is only half of that which occurs when fresh potatoes are fried in oil.

Investigations are in progress in regard to (a) the further reduction of oil requirements in view of its scarcity, (b) the factors governing the degree and manner of puffing (e.g. dehydrated potatoes do not puff well if freshly dehydrated), (c) the reason for the increase of oxygen and carbon dioxide in the air of the containers, and (d) the retardation of the development of off-flavour during long period storage, etc. Other methods of puffing, e.g. by means of hot air blast, and by radiation, seem promising. Investigations are also in progress in connection with the puffing of different vegetables and fruits, for the production of snacks and breakfast foods.

Soup Mixtures.—The possibility of incorporating vegetable waste materials such as beetroot and carrot tops and the outer leaves of cauliflower and cabbage in soup mixtures, particularly for use by the low income groups, is being fully explored. The total cost of the soup mixtures could, by this means, be reduced to 1s. 3d. per lb. of soup mixture.

Investigations are in progress to accelerate the drying of vegetables for soup mixtures, and the reconstitution of the final products.

Now that the necessary materials are becoming available, work has been commenced on the inclusion of meat products and flavourings in soup mixtures.

Drying of Peas at Upington.—Investigations were conducted, in collaboration with the Division of Horticulture, on the atmospheric drying of green peas to evolve a suitable method for application by farmers.

Green peas could be dried in the shade to a moisture content varying between 7 per cent. and 9 per cent., the drying time ranging between 50 hours and 100 hours. The best products and highest Vitamin C contents of all blanched products were obtained by the serial blanching of shelled peas in a 0.25 per cent. sodium sulphite solution. These are comparable in quality to green peas dehydrated to this moisture content within 8 hours, but storage investigations showed that the dehydrated articles retained their quality, particularly flavour, better than the sun-dried peas. The investigations are to be repeated and continued in the coming season, in an endeavour to improve the sun-dried products, and work is also to be commenced on the shade-drying of other vegetables.

Salt.—By means of the laboratory dehydrators it was possible to work out the drying times for wet salt from the mines under different conditions of initial moisture content, loading density, and air temperature, etc. Naturally wet mine-salt chunks proved much more difficult to dry than remoistened table salt.

Other products for which suitable preparation and drying conditions have been investigated, are: beetroot and carrot tops, the outer leaves of cabbage and cauliflower, sweet potatoes, tomatoes, green mealies, sauerkraut, kaffir watermelon for soup mixtures; peach halves, bananas, pineapples, citrus and guava slices for confectionery purposes; gooseberries, strawberries (which made very good jam), and blackberries and loganberries (both of which remained tough on reconstitution); sole fillets (which formed a relatively poor dehydrated article) and liver (which was unattractive).

Pectin.—Work is being continued on the development of a simple and cheap method, for application at dehydration factories, of extracting a pectin product from citrus peels. The method adopted and developed for pectin strength determinations is the accurate measurement of sag in jellies prepared under closely controlled conditions, which gives reliable and reproducible values.

Rhodesia.—Our technical advice and plans were followed in the erection of the Rhodesian dehydration factories and in the preparation, dehydration, packaging and inspection of the products. Close co-operation was continued, and technical assistance was rendered wherever possible.

During the year two officers of this laboratory accepted posts in Rhodesia, one having become the Dehydration Officer of the Colony.

Cold Storage.

During the year 8 plans were scrutinized for the construction of new cold stores or for additions to existing stores, and 40 existing cold stores were inspected in technical detail. Most of the cold stores complied with the regulations, but a few were found to be in a poor state and suggestions for improvement were made.

Eggs.—A considerable number of flats and fillers were tested by means of a method evolved in the laboratory for their suitability for the long-period storage of eggs. The problem of mould growth on egg boxes during cold storage was fully investigated and precautionary suggestions were issued for sterilizing the boxes with a suitable fungicide during the coming egg season.

The cleaning and fumigation of a number of egg stores was supervised on behalf of the Director of Food Supplies and Distribution.

A small-scale industrial trial was made in connection with the oiling of eggs for commercial cold storage. After long-period storage the oiled eggs were superior to the controls as regards yolk index, thick white and, particularly, air space, which was much smaller for the oil-dipped eggs than for the controls. There were no noticeable differences in colour, odour and flavour between the oiled eggs

Meat.—The frozen meat stocks of the Government were inspected from time to time and reports issued to the Director of Food Supplies and Distribution in regard to freezing rates, storage temperatures and fluctuations, stacking, desiccation and condition of the meat. Generally the conditions of storage specified by the laboratory were maintained, but in several cases the position was considered to be unsatisfactory.

Fish.—Investigations were conducted on behalf of a large company on the possibility of re-using washing water. Only chlorine proved really effective, but the high chlorine content excluded its re-use. Tests were also made on ice stored on fishing trawlers, which proved to be a potential source of contamination when subsequently used for keeping the fish. The contamination was largely superficial and could be greatly reduced simply by washing the ice blocks and the breaking and storage equipment immediately before use.

Preliminary investigations on the condition known as "milky fish" suggested that contamination with a type of halophilic yeast occurred in the brine tanks prior to smoking.

Drying of Grain.

Investigations on the drying of grain were concluded in the pilot plant erected at Ficksburg. The trials have proved completely successful in every respect, and showed the absence of any effect of the drying on the baking and sprouting qualities of the products.

As a result of the investigations, a full-scale plant has been worked out for drying 1,000 bags of wheat per day, and corresponding quantities of maize, oats, etc., without removal of the materials from the bags.

The cost of the plant is estimated at about £3,000, and the drying cost, including labour, fuel, depreciation, interest, etc., works out at under 6d. per bag, on the assumption that the plant is used for only 3 months per year. It is hoped to publish a complete report on the results of the investigations in the near future.

Chicory Drying.

On the experience gained in the laboratory tests a pilot bin-type of drier for chicory was designed and constructed in co-operation with the Chicory Control Board. Investigations on the pilot plant showed that uniform drying could be obtained, and that the products were better than both local and imported roots dried by conventional methods.

Special high-grade steel knives had to be fitted to the dicing machine, as the ordinary cutting blades are blunted very rapidly by the chicory. The cost of drying worked out at 3s. 6d. per 100 lb., and consideration is now being given to a possible method of reducing these costs.

The existing pilot bin-drier is to be used in the coming season for investigations on the drying of citrus peels.

Seal-Oil Extraction.

In collaboration with the Superintendent of the Government Guano Islands, a pilot plant has been designed for installation on the S.S. "Gamtoos" for the purpose of extracting seal oil from blubber on board ship. The whole plant is now being constructed and assembled to apply the process worked out in the laboratory.

In the laboratory tests, an oil of extremely high quality was obtained by the addition of water and extracting at 40 lb. steam pressure. Complete extraction takes place within 30 minutes, thus enabling a small unit to handle a large capacity daily. The investigations are being continued with the object of further simplifying the process and reducing the water requirements.

By centrifuging, the moisture content of the oil could be reduced to a small value, particularly at elevated temperatures; for instance, by increasing the temperature from 45°C to 95°C the residual moisture content in the centrifuged oil decreased from 1.8 per cent. to 0.4 per cent. Upon settling, the moisture content of the oil was about 2 per cent. after 15 minutes, but it required 18 hours for the moisture content to drop to 0.5 per cent.

After completion of the work on oil extraction it is intended to undertake investigations on the shipboard handling and processing of seal livers, and the treatment and drying of the carcasses, which normally are dumped.

The Government Guano Islands.

T. L. Kruger, Superintendent.

Staff and Labour.

THE fixed establishment has been increased during the period under review from 37 to 69 units. The additions consist of: One post of headman, Grade II, and one post of headman, Grade III, the incumbents of which serve as engine-drivers of the motor patrol boats "Pikkewyn" and "Sea Bird", respectively, one stores assistant, Grade II, one temporary biologist and the crew of the ss. "Gamtoos" which consists of 28 units employed on a temporary basis.

The monthly average of labourers employed in the stores was 39. whilst 645 casual labourers were engaged for the collection of guano and penguin eggs and for sealing. During the off-season 96 were retained on the islands to serve as boatmen, cooks, etc. The number of coloured labourers offering themselves for this class of work is gradually decreasing with the result that more native labourers have to be engaged.

Several minor accidents to labourers occurred during the year, the most serious of which was a case of a fractured leg. One labourer died on Ichaboe Island as a result of natural causes.

Offices and Stores Accommodation.

The office accommodation has become inadequate now that a biologist has been added to the establishment. It is furthermore desirable that a room be provided at the office which could be used by the captain and officers when the vessels are in port.

The boat-building shop has been renovated by the Department of Public Works and is now in good order. The building of the new guano store at Bellville has not yet been commenced with.

Islands.

Steady progress has been made with improvements on the islands, but much remains to be done, especially in repair work to jetties. A supply of second-hand rails has now been obtained from the South African Railways and Harbours Administration, and active repair work and improvements will be undertaken during the ensuing summer months.

Protection of Sea-Birds and Seals.

A number of prosecutions were instituted against fishermen during the year for transgressions at the islands, particularly at Dassen Island. Reports are continually received from headmen to the effect that fishing boats came within the prohibited areas and that the numbers of the vessels are in some cases covered up or obliterated. The most disturbing factor is that fishermen do not hesitate to come up close to the islands to fling their nets over flocks of young birds which are caught for bait. Young Malagas are particularly easy prey to such tactics. The birds, especially sea-duikers, which are the best producers of guano, are dwindling noticeably in numbers.

Guano Season.

Considering the unfavourable conditions and the abnormal behaviour of the birds, the present season may be regarded as a fairly satisfactory one, as the quantity of guano collected and allotted is very little below the average distributed during the past ten years. The allotment for the year was fixed at 6,000 tons and no

difficulty was experienced in procuring that quantity, notwithstanding the fact that over 400 tons were lost at Bird and St. Croix Islands in Algoa Bay, as a result of unexpected early heavy rains. The number of sea-duikers and the manner in which they arrived for the breeding season were most disappointing. On Dyers, Dassen and Vondeling Islands there were no duikers at all, while at the other islands which they usually frequent, they were conspicuous because of their small numbers and by reason of the fact that they arrived in small flocks up to as late as January. As a result of their late arrival for the breeding season it was impossible to commence with the collection of guano until April. Only a relatively small proportion of farmers would have received their guano in time for the ploughing season, had it not been that ploughing was delayed by the lack of rain. Comparatively few complaints were received from farmers concerning the late allotment of guano.

The following are the details of the volume of business conducted in respect of the year's guano yield:—

Number of applications: 7,222.

Areas Cultivated, in Morgen.

<i>Wheat.</i>	<i>Vegetables.</i>	<i>Onions.</i>	<i>Potatoes.</i>	<i>Total.</i>
456,803	45,215	14,114	61,655	577,787

Number of bags of guano allotted: 60,070.

Number of bags of guano taken up: 58,783.

Number of bags of guano issued to Government Departments: 29.

There was a considerable increase in the number of applicants and in the acreage cultivated.

The analyses for the past five years are as follows:—

	1942.	1943.	1944.	1945.	1946.
Phos. Oxide, Total.....	10.1	10.4	10.3	10.4	10.5
Phos. Oxide, sol. in 2 per cent. cit. acid...	9.4	9.4	9.5	9.9	9.7
Phos. Oxide, sol. in water.....	3.1	3.2	3.1	2.7	2.7
Nitrogen.....	10.0	10.8	10.4	10.2	10.0
Potash.....	2.2	1.7	2.4	2.0	2.1

Penguin Eggs.

In view of the general shortage of foodstuffs and the fact that conditions appeared favourable, it was considered advisable to collect penguin eggs, but on account of the general rise in the costs of labour, foodstuffs, transport and packing material it was found necessary to effect sales only in boxes of two dozen eggs, at 10s. per box. The results proved satisfactory viz.:—

No. of boxes collected and sold.	Revenue Derived.	Expenditure.
5,625	£2,812 10s.	£2,500 approx.

Sealing.

Sealing was undertaken during the winter and the summer seasons. During the winter season 7,023 pup skins were taken, of

THE GOVERNMENT GUANO ISLANDS.

which 3,970 were found suitable for export. The remainder were disposed of locally as leather skins.

The season was not as successful as the previous one, for the reason that, owing to the unfortunate grounding of the ss. "Otavi", the expedition sent to the northern seal preserves was somewhat delayed and the weather was not very suitable for sealing operations during the remaining portion of the sealing season.

During the summer season 8,597 wig skins were taken, which were all disposed of locally as leather skins.

Summary in respect of Seal and Shark Products.

Number Taken.	Skins.	
	Colonial Preserves.	Northern Preserves.
Pups.....	3,611	3,412
Adults.....	3,780	4,817
TOTAL.....	7,391	8,229

Skins Exported.

Year.	Number Sent.	Number Disposed of.
1942.....	2,030	—
1943.....	11,000	2,030
1944.....	6,000	3,010
1945.....	3,970	8,091
1946.....	—	2,480
		15,611
Balance on Hand at Factory.....		7,389
TOTAL.....	23,000	23,000

Seal Oil: 21,568 gallons oil sold	£4,344 4 0
828 gallons gurru sold	48 6 0
	£4,392 10 0

Seal Liver: 63,489 lb. sold ..	£2,128 10 9
Shark Liver: 6,139 lb. sold ..	£337 0 0

Shipping.

It has been the practice, since the Government assumed responsibility for the administration of the Guano Islands in 1905, to charter ships for the purpose of serving the islands and conveying the products to store and large sums of money were spent annually in chartering vessels. Prior to 1905 the islands were worked under contract. During the war period and subsequent thereto, considerable difficulty was experienced in obtaining suitable and sufficient vessels to serve the islands. In addition, the freight charges increased approximately 100 per cent.

The ss. "Otavi", was the only vessel specially equipped to serve the northern islands and was chartered for many years, but unfortunately stranded on 14th July, 1945. Although the owners of this vessel took immediate steps to replace the lost vessel and promised to have a suitable ship available in time for the next guano season which normally commences during February, they gave notification on 12th November, 1945, that they had been unable to procure a suitable vessel at a reasonable figure and that they were in fact no longer interested in the guano trade. This decision of the Company placed the Department in a most difficult position and there was no alternative for the Department but to acquire a ship of its own and the opportunity fortunately presented itself on the arrival in port of the ss. "Gamtoos" on 11th January, 1946. The ship was used as a salvaging vessel during the war period, and, since she was of the correct tonnage for the island work and had the necessary fresh water tankage and accommodation for labourers, it was decided to acquire the vessel from the S.A. Navy. This was done on 15th February, 1946, but as she had to be converted from a salvaging vessel into a transport and be manned and equipped, she was not able to proceed to sea until 10 April, 1946. This meant that the allotment of guano was delayed for a period of approximately six weeks.

M/V "Pikkewyn".—Although a contract was entered into with Messrs. Louw & Halvorsen for the building of this cargo motor boat of 80 tons during February, 1945, and although the keel was laid down shortly afterwards, the vessel was completed and taken over only on 11 June, 1946. The long delay in completing the vessel was due entirely to the shipping difficulties experienced after the cessation of hostilities, as no shipping space could be found for the machinery which had to be imported from England.

This vessel will have her base at Penguin Island and will be used for the purpose of patrolling and serving the northern group of islands.

"Sea Bird".—As a result of a broken crankshaft, this boat was laid up from 28 May, 1945, until 25 March, 1946, the long delay being due to the fact that no shipping space could be found for the crankshaft which had to be imported from England.

This boat is now stationed in Saldanha Bay and will patrol and serve the colonial islands.

Factory Ship.—While the collection and the sale of guano have hitherto been the most important functions of this Organization, with sealing only a secondary consideration, the prospects are that the products which are derivable from seals might be developed into an industry as important as the guano industry. With a view to developing such products, steps are being taken to equip the ss. "Gamtoos" as a factory-ship and experiments will be carried out aboard the vessel during the ensuing sealing season.

Guano Prospects.

Although it is still too early to predict the prospects for the following guano season, the reports from the various islands are fairly favourable, and, unless something untowards happens, a fairly successful season may be expected.

Departmental Publications.

D. J. Seymore, B.A., Editor.

DURING the war years an unprecedented demand for Departmental literature was experienced, as is evidenced by the fact that, whereas in the pre-war period the annual income from the sale of bulletins averaged about £200, the sales rapidly increased from 1940 onwards. The annual figures steadily rose to £1,200, subsequently to £1,400, and for the present report year the record figure of £1,694 has been reached—this despite the fact that some of the best sellers such as “Foods and Cookery”, “Handbook for Farmers”, etc., were out of stock, most of the available bulletins being of the 3d. and 6d. class. This large increase can partly be attributed to the return of our soldiers to civilian life, and the general eagerness to embark on some farming enterprise or other.

During the year 10,481 inquiries were received for literature, as compared with 9,651 during the previous year. As a result of these inquiries some 44,740 bulletins were supplied to applicants, and of this total about 8,900 were issued gratis. In the previous year a total of 31,180 bulletins was supplied, thus giving an increase of 13,559 for the present year. The sale of agricultural literature realized the record sum of £1,694, of which £308 represents subscriptions to “Farming in South Africa” collected for the Government Printer. During the year a sum of £165 was returned to applicants as the special publications applied for where no longer in stock.

Bulletin Series.

The Department continues to publish its series of bulletins. During the war period the printing of scientific papers was suspended, and only some of the most popular bulletins were printed.

The series of scientific bulletins has now reached the total of 265, and during the present report year 19 new manuscripts were submitted for publication, while 3 science bulletins were published and added to the series. The popular series has reached a total of 272, and during the year 11 manuscripts were approved for publication, while 11 were printed and added to the series.

Apart from these two series, the Department also publishes from time to time a series of reports and other important papers as unnumbered bulletins, and for this series 10 manuscripts were received, and 4 published during the year.

Press Service.

Apart from this regular source of agricultural information, the Department has a regular Press Service for the newspapers and agricultural journals in the Union. During the year, 26 Press Service bulletins (issued fortnightly at present) containing a total of 103 short articles on agriculture were supplied to the Press for publication.

Furthermore, 26 urgent press statements were sent telegraphically to the Press, while two other special statements were posted to the Press for publication.

Radio and Publicity Series.

Since 1928 the Department has been making use of the radio as an additional medium for bringing agricultural advice to farmers.

Originally a weekly service was instituted, but, in 1939, this service was extended to a daily broadcast for which object a special organizer was appointed. In 1942, however, the Food Controller took over the radio service for propaganda for greater food production. The radio talks in this connection were printed in the form of a publicity series and issued gratis to the public. This publicity series continued up till 1944, when Food Control became a separate institution, and the Department then issued the Agricultural production series, as well as Information to Housewives. In this way some 24,000 leaflets were supplied to the public weekly. The Agricultural production series had, however, to be discontinued in 1946, owing to a change in the form and nature of the agricultural broadcasting service.

Farming in South Africa.

During the war this monthly journal of the Department had to publish many items of information which would otherwise have been issued in the form of bulletins. Much of this information was of a very technical nature, but its publication in "Farming in South Africa" was the only feasible means of making known the results of research work for practical application by farmers.

The number of subscribers on 31st August 1946, was 9,272, the respective numbers for the English and the Afrikaans editions being 5,229 and 4,043. Altogether 156,400 copies of Farming in South Africa were distributed, 84,500 in English and 71,900 in Afrikaans. The cost of printing amounted to £6,353, of which £3,284 was for the English and £3,069 for the Afrikaans. The revenue from subscriptions and advertisements amounted to £2,537.

Handbook for Farmers.

There is still a demand for the Handbook for Farmers, but this book cannot be republished as yet. Economic conditions in the field of agriculture are still too unstable for definite advice to be prescribed in a such book which will have to serve as a guide for many years to come.

The Meat Scheme.

H. P. Smit, Director of Meat Supplies.

THE progress made with the meat scheme in 1945 was maintained during 1946 and the administration of this measure has improved in every respect.

In respect of supplies, in these times of scarcity still one of the focal points of any marketing system, the position improved considerably during 1946 in comparison with the previous year. During the first nine months of 1946, for instance, 657,527 cattle units were received at the nine controlled centres, as against 598,571 during the corresponding nine months of 1945, as will be seen from the following table:—

Slaughtering.—Nine Controlled Areas.

	Cattle.	Sheep.	Pigs.	Calves.	Cattle Units.
1945—					
January/September	455,147	1,325,015	250,593	59,655	598,571
1946.....	528,408	1,274,391	195,837	59,920	657,527

What is especially encouraging is the fact that the slaughtering during the months of scarcity of 1946 up to the present date (22 November 1946) have been maintained at a much higher level than during the months of scarcity of 1945. The following are the comparative figures:—

Slaughtering in Nine Controlled Areas.

Week ending.	Cattle Units.	Week Ending.	Cattle Units.
6/10/1945.....	14,164	5/10/1946.....	19,932
13/10/1945.....	14,731	12/10/1946.....	16,254
20/10/1945.....	14,575	19/10/1946.....	18,734
27/10/1945.....	13,736	26/10/1946.....	18,299
3/11/1945.....	13,577	2/11/1946.....	19,306
10/11/1945.....	13,662	9/11/1946.....	16,722
17/11/1945.....	13,076	16/11/1946.....	16,697

This improvement in the supplies position is entirely due to the improved supply of cattle. In point of fact, the supply of cattle increased to such an extent that it more than neutralized the sharp decrease in the supply of sheep and pigs.

Since beef constitutes such a predominantly important part of the total annual consumption of meat and since beef marketing has such a strong seasonal tendency, it was obvious from the start that a seasonal premium would have to be incorporated in beef prices, if adequate supplies were to be drawn during the scarce season. Originally a seasonal premium of 10s. was contemplated, but owing to technical difficulties, a premium of only 5s. per 100 lb. could be applied during the 1944-45 season. This premium was, however, supplemented by a special premium during November, 1944, and the subsequent months of scarcity, bringing the total up to approximately 8s. 6d.

The full premium of 10s. was incorporated in beef prices in respect of the 1945/46 season but experience showed that it was not sufficient to draw adequate supplies during the season of scarcity and consequently it was decided to grant a premium of 15s. during the 1946-47 season. As has already been shown, the supply position is developing more favourably during the scarce months of 1946, than during the scarce months of 1945—as far as can be judged at the moment—and the step of increasing the seasonal premium has, therefore, proved itself to be justified. It must, however, be admitted in this connection that the climatic conditions of 1946 have thus far been far more favourable than those of 1945 and that the supply over two years has been very largely influenced by this factor.

The supply of slaughter-stock under the scheme also presents considerable difficulties in another respect, viz., in respect of the fluctuation in the supply of the various classes of slaughter-stock. Cases sometimes arise, for instance, where although all centres are well supplied with meat, a certain centre may be suffering from a shortage of mutton while another centre is well supplied, and after six to nine months the position may be reversed. The following table illustrates this fact.

Comparative Schedule of Arrivals of Cattle and Sheep at Cape Town and Port Elizabeth, Indicating the Inverse Proportions of the two Types of Stock that arrive at Different Centres Simultaneously.

Week Ending.	ARRIVALS AT			
	CAPE TOWN.		PORT ELIZABETH.	
	Cattle (Quota 1,698).	Sheep (Quota 19,833).	Cattle (Quota 423).	Sheep (Quota 5,314).
29/6/1946.....	3,003	2,277	170	5,883
6/7/1946.....	3,028	2,765	270	6,144
13/7/1946.....	2,549	1,784	247	6,164
20/7/1946.....	3,448	2,781	344	6,562
27/7/1946.....	3,307	3,915	266	7,062
3/8/1946.....	3,646	3,310	200	7,081
10/8/1946.....	3,189	2,270	163	4,558
17/8/1946.....	2,324	3,601	215	5,479
24/8/1946.....	3,184	4,786	232	6,122
31/8/1946.....	2,992	4,439	211	6,555
7/9/1946.....	2,611	5,661	342	5,198
14/9/1946.....	2,742	6,890	356	6,140
21/9/1946.....	2,657	5,474	329	5,898
28/9/1946.....	2,055	6,364	371	6,419
5/10/1946.....	2,577	7,459	303	6,845
12/10/1946.....	2,535	6,908	260	4,805
19/10/1946.....	2,908	10,399	489	3,720
26/10/1946.....	2,399	13,086	454	4,051
2/11/1946.....	3,158	11,685	411	2,612
9/11/1946.....	1,490	10,378	384	4,097
16/11/1946.....	2,413	12,193	408	2,587
23/11/1946.....	1,829	15,973	464	2,425

It will be noticed that round about June Cape Town was receiving hardly any sheep, but plenty of cattle, while proportionately more sheep than cattle were arriving at Port Elizabeth, and that a reversal of this relationship between the two centres developed over the past six months.

THE MEAT SCHEME.

The means employed to bring about a proportional distribution of available supplies among the various centres is first, the variation of producers' prices between centres, thus, for instance, sheep prices are higher for Durban than for Cape Town, while cattle prices, on the other hand, are higher for the latter centre than for Durban. In the case of beef, the difference between certain centres is changed during certain fixed seasons of the year, but in the case of mutton the differences announced at the beginning of the year remain operative throughout the year. The following schedule illustrates this differentiation.

Cattle (Prime Grade) (Seasonal premium excluded).

Periods.	Witwaters- rand.	Durban.	Cape Town.	Port Elizabeth.
January/March...	58s.	55s.	60s.	55s.
April/June.....	58s.	55s.	59s.	55s.
July/December.....	58s.	58s.	59s.	55s.

Another means of distributing the available supplies as evenly as possible among the various centres, is the transferring of meat from one centre to another, where possible. In this respect the Food Control Organization is, however, seriously hampered by the lack of cold-storage facilities, since carcasses first have to be chilled before transportation and the available space is required in the first instance for the storage of a reserve supply for months of scarcity.

To sum up, it can be said that the difficulties that have occurred under the scheme during the past two and a half years since its inception, chiefly amount to the maldistribution of cattle over the various seasons of the year and a maldistribution of available supplies among the various controlled areas. If the measure is to gain the necessary general popularity, it will, therefore, be necessary to improve on these aspects, if possible.

Although the maximum amount of meat kept in cold storage during 1946 did not exceed that of 1945 by much, the supply could be carried deeper into the season of scarcity owing to the more favourable supply position. On 16 November 1946, for instance, the cold-storage supply was still 47,235 cattle units in comparison with 18,308 on 17 November 1945.

Another phenomenon which has occurred under the scheme has been that when a certain class of slaughter-animal or slaughter-stock generally becomes scarce, the uncontrolled areas draw relatively more of the available stocks than the controlled areas, doubtless because butchers in the uncontrolled areas are not subject to restrictions in respect of the prices they can pay to producers, while fixed prices are enforced in controlled areas. This is clearly reflected in the following table from which it will be noticed that a steadily increasing percentage of sheep and pigs of which there is a long-term shortage, is being drawn by the uncontrolled areas as compared with the controlled areas.

This phenomenon gave rise among other things to the proposal that the meat scheme should also be applied in certain of the large country towns. This proposal is being considered.

The Food Control Organization made use of the seasons of plenty in both 1945 and 1946 to establish new trade quotas, based on

The proportion of slaughterings in uncontrolled areas to those in controlled areas (expressed as a percentage).

	Cattle.	Calves.	Sheep.	Pigs.
1942—				
First quarter.....	27	10	35	—
Second quarter.....	24	3	30	—
Third quarter.....	24	16	33	—
Fourth quarter.....	27	8	37	—
1943—				
First quarter.....	19	1	28	—
Second quarter.....	31	9	39	—
Third quarter.....	28	13	39	—
Fourth quarter.....	36	17	40	—
1944—				
First quarter.....	29	9	36	—
Second quarter.....	30	11	26	—
Third quarter.....	36	7	22	18
Fourth quarter.....	38	13	31	37
1945—				
First quarter.....	30	10	55	33
Second quarter.....	29	11	42	34
Third quarter.....	27	13	47	37
Fourth quarter.....	30	14	44	33
1946—				
First quarter.....	27	14	56	41
Second quarter.....	26	15	53	40
Third quarter.....	29	18	45	45

saturation issues of meat to the trade. As a result it became possible for the Organization to make a more equitable distribution of available supplies among meat dealers. During the past year the Organization was also in a better position to bring about, in the light of experience, a more equitable distribution of the various grades of meat among meat dealers. In discussing the issue of meat to the trade, mention must be made of the increasing complaints from meat dealers and the public lately about the quality of the available meat. The steady deterioration of the quality of cattle received in controlled areas since the commencement of the scheme is strikingly illustrated in the following table:—

Grading statistics in respect of the nine controlled areas for progressive periods from 15 May, 1944.

Grade.	15/5/44 31/12/44	15/5/44 31/3/45	1/4/45 30/9/45	1/4/45 31/12/45	1/4/45 31/3/46	1/4/45 30/6/46
Super.....	0.9	0.8	0.4	0.5	0.4	0.1
Prime.....	8.9	8.6	6.2	5.8	6.0	3.1
Grade I.....	32.0	30.3	26.2	24.3	23.9	19.1
Grade II.....	32.1	32.2	36.9	36.3	36.4	43.0
Grade III.....	18.8	20.5	23.3	25.8	26.2	28.2
Grade IV.....	4.2	4.3	3.8	4.0	3.8	3.2
Reserved.....	2.6	2.8	2.6	2.7	2.6	2.4
Rejected.....	0.5	0.5	0.6	0.7	0.7	0.9

Although it is not suggested that this is the only reason for the deterioration in the quality of beef marketed under the scheme, it

THE MEAT SCHEME.

must be admitted that the drought conditions prevailing in an increasing measure since shortly after the inception of the scheme, have played an important rôle in bringing about this unfortunate state of affairs.

Offal and Skins.

As is now doubtless generally known, producers received separate settlements in respect of meat, offal and skins under the scheme. Meat prices are fixed by the Minister and announced in the *Government Gazette*. Offal prices, on the other hand, are arranged on behalf of producers with the dealers concerned by the Meat Control Organization, and all agents are expected to maintain the fixed prices and to sell the offal of their consignments to the dealers indicated by the Organization. In this way uniform prices for offal are maintained in a particular centre for a longer or shorter time.

When the scheme was originally instituted, offal prices were fixed on a carcase-weight basis at certain centres and per piece at others. Thus, for instance, the beef-offal price was 3s. per 100 lb. carcase weight in Cape Town, while in Port Elizabeth it was the sum of the values of all the organs constituting a complete offal—about 17s. 6d. Since then offal prices have been determined on a carcase-weight basis everywhere, except at Pietermaritzburg, and placed on the same level as far as possible. The Organization is, however, experiencing some difficulty in this respect because the demand for offal is smaller in the smaller centres (excluding Pietermaritzburg) than in the larger centres, with the result that a slightly lower price is fetched in the smaller centres.

Originally it was the policy to entrust the distribution of offal to those dealers who were engaged in the offal trade just before the scheme. Under the scheme the offal also had to move direct from the agents to such dealers. At some centres where there were no specializing offal dealers (or no satisfactory arrangements could be made with the existing dealers), machinery had to be instituted *de novo*, either by calling for tenders or by negotiation. At East London, for instance, there was no offal dealer because each butcher was responsible for the disposal of his own supplies, and in this case it was arranged with the butchers to form a pool in order to facilitate the distribution of offal amongst themselves. At one centre (Kimberley), after considerable difficulty with the contract system, the Organization itself took over the distribution of offal among dealers. In another (Durban) where the Organization undertook the distribution of clean offal like livers, tongues and tails, from the start, and agents sold rough offal direct to consumers or to native hawkers, as a result of which varying prices were paid out to producers—the Organization formed an offal company for the distribution of all offal.

Because, as mentioned above, a separate settlement is made in respect of meat, offal and skins, all rises in offal prices could be conveyed to producers immediately they became effective. If producers were paid an inclusive price for meat, offal and skins, any rise in offal prices would in the first place benefit the Meat Control Organization and producers would be left more or less in the dark as to the returns from those products. The advantages of this method of price determination and settlement to producers are very well illustrated by the phenomenal rise in skin prices. During 1946, for instance, skin prices rose by leaps and bounds as will be seen from the following table, and these increased prices were of immediate benefit to the producers.

A summary of the offal prices ruling and systems practised in the nine controlled areas is given in the following table:—

Type of Offal.

Centre.	Cattle.	Sheep.	Calves.	Pigs.
	Per 100 lb.	warm car-	case weight.	Per piece.
Johannesburg.....	4s. 3d.	6s. 3d.	4s. 3d.	1s. 6d.
Pretoria.....	4s. 3d.	6s. 3d.	4s. 3d.	1s. 6d.
Cape Town.....	4s. 3d.	6s. 3d.	4s. 3d.	1s. 6d. per 100 lb. carcase weight.
Durban.....	5s. 0d. Average.	6s. 0d.	5s. 0d.	1s. 0d. per 100 lb. carcase weight.
East London.....	4s. 3d. Average.	6s. 6d.*	4s. 0d.	6d. per 100 lb. carcase weight.
Port Elizabeth.....	4s. 2d.*	7s. 0d.*	2s. 0d.* per piece	1s. 0d.-2s. 0d. * by weight.
Bloomfontein.	4s. 3d.*	7s. 0d.*	2s. 0d. per piece.	1s. 3d. per piece.
Kimberley	4s. 3d.	7s. 0d.	1s. 6d. per piece.	1s. 3d. per piece.
Pietermaritzburg... ..	Sold out of hand at best prices.			

* Less specific deductions for condemned portions.

Skin Prices. (Witwatersrand).

	26/11/45	28/3/46	20/5/46	3/6/46	2/7/46	9/9/46
Merinos—						
Combings.....	6s. 6d.	8s. 0d.	8s. 0d.	9s. 6d.	10s. 0d.	11s. 0d.
Long Wool.....	6s. 6d.	8s. 0d.	8s. 0d.	8s. 6d.	8s. 6d.	9s. 0d.
Medium Wool... ..	6s. 6d.	6s. 6d.	6s. 6d.	6s. 6d.	6s. 6d.	7s. 6d.
Short Wool.....	4s. 0d.	5s. 0d.	5s. 0d.	5s. 6d.	5s. 6d.	6s. 6d.
Pelts	3s. 0d.	4s. 0d.	4s. 0d.	4s. 6d.	4s. 6d.	5s. 0d.
Shorn	3s. 0d.	4s. 0d.	4s. 0d.	4s. 6d.	4s. 6d.	5s. 0d.
Coarse Wool and Coloured—						
Long.....	3s. 0d.	4s. 0d.	4s. 0d.	4s. 0d.	4s. 0d.	4s. 0d.
Shorn.....	2s. 6d.	2s. 6d.	2s. 6d.	3s. 3d.	3s. 3d.	3s. 9d.
Afrikaners—						
Large.....	4s. 3d.	6s. 0d.	9s. 0d.	9s. 6d.	10s. 0d.	11s. 0d.
Lambs.	4s. 3d.	6s. 0d.	9s. 0d.	7s. 0d.	7s. 6d.	8s. 0d.
Goat skins.....	4s. 0d.	4s. 0d.	4s. 0d.	5s. 0d.	5s. 0d.	6s. 6d.
Angoras—						
Long	—	4s. 0d.	4s. 0d.	5s. 0d.	5s. 0d.	6s. 6d.
Shorn.....	—	—	—	—	—	—
Calf skins.....	3s. 0d.	3s. 0d.	3s. 0d.	4s. 6d.	4s. 6d.	5s. 0d.

An event in connection with the marketing of skins under the scheme which is deserving of mention, is the entrance into the skin trade of certain co-operative organizations and of a group of Witwatersrand agents which has considerably strengthened the competitive element in the trade in question. The co-operative organizations are, however, as yet by no means represented in all centres and still have to find their feet. They can be expected to play an important rôle in the marketing of skins under the scheme in due course and will assist in establishing producers' prices at the highest possible level.

THE MEAT SCHEME.

Towards the end of 1945 it was decided to request the Meat Trade Costs Committee which had then just completed its investigation into trade margins with regard to meat, also to investigate the margins in respect of offal and skins and of agencies. Owing to the fact that two members of the committee were members of parliament who did not wish to be absent from Cape Town during an important parliamentary session, the committee could only commence its activities after the session. It is understood that the report of this committee will be ready in the near future.

The developments arising from the French Report on the South African food position and the possibilities of rationing were of great importance to the meat scheme. It will be remembered that the publication of the report was followed by the establishment of a Directorate of Food Supplies and Distribution, to succeed the old Food Control Organization, and that the meat scheme was at the same time divorced from the old Food Control Organization to form an independent organization with its own Director under the Department of Agriculture.

Simultaneously with the establishment of the Directorate of Meat Supplies, a re-distribution of functions between this Directorate and the Meat Board also took place, under which the Meat Board is held responsible for the supplying of slaughter-stock to the various markets and the Meat Directorate for the slaughtering and distribution among dealers. Where receiving and handling agents were formerly appointed by the Food Control Organization, they will in future be nominated by the Board who will also undertake all arrangements in connection with the disposal of hides and skins.

Courses of Training in Agriculture, 1947

AT THE COLLEGES OF AGRICULTURE

at Cedara, Natal; Glen, Orange Free State; Middelburg, Cape Province; Potchefstroom, Transvaal; Stellenbosch-Elsenburg, Cape Province.

I. AT ALL COLLEGES.

A Two-Year Diploma Course in General Agriculture.

Inclusive Fee: £36 per year, plus breakage deposit and sports fee.

Minimum Entrance Qualifications: Std. 8, and 16 years of age.

This course is held regularly at all Colleges. The course beginning in February 1947 is fully booked-up at all Colleges. Applications for 1948 are now being received, and those interested in the 1948/49 Course are advised to communicate without delay with the Principal of the College of their choice. Prospectuses and application forms are obtainable from the Principals of Colleges.

(N.B.—These courses are only open to men).

II. SHORT COURSES.

These courses will be held as shown below:—

<i>College and Course.</i>	<i>Duration.</i>	<i>Fee.</i>
Glen College of Agriculture.		
1. Special Grain-Grading (Students taking this course can qualify for the Grain Graders' Certificate)...	23 June to 18 July.....	6 0 0
2. Judging of Friesland Cattle... ..	23 June to 27 June.....	1 10 0
3. Poultry Farming.....	7 July to 18 July.....	3 0 0
Potchefstroom College of Agriculture.		
1. Animal and Field Husbandry and Farm Management.....	30 June to 18 July.....	4 10 0
2. Poultry.....	30 June to 4 July.....	1 10 0
3. Home Economics (Weaving)....	7 July to 11 July.....	1 10 0
4. Home Economics (Designing and Draping of Garments).....	14 July to 18 July.....	1 10 0
Stellenbosch-Elsenburg College of Agriculture.		
At Elsenburg.		
1. Dairy and Pig Farming.....	30 June to 4 July.....	1 10 0
2. Viticulture....	30 June to 4 July.....	1 10 0
3. Poultry.....	7 July to 11 July.....	1 10 0
4. Horticulture.....	7 July to 11 July.....	1 10 0
At Stellenbosch.		
5. Home Economics.....	30 June to 4 July.....	0 5 0*
6. Grain Grading.....	30 June to 11 July.....	0 10 0*
7. Vegetable Production.....	1 to 5 December.....	0 5 0*

* Fees at Stellenbosch are for tuition only. Students must arrange their own accommodation.

N.B.—

1. Applications should be addressed to the Principal of the College concerned.
2. Accommodation at Colleges is limited and early application is recommended. The closing date for applications for short courses is 14 days before the course begins.
3. Subject to accommodation being available, women may be accepted for the short courses.
4. All fees, except for short courses at Stellenbosch, include board and lodging as well as tuition.
5. Railway concession certificates are available to all students attending courses at Colleges of Agriculture.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26

FEBRUARY 1947

No. 294

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Price Review for December 1946.*

Fruit.—Large quantities of peaches, apricots and plums reached the markets and experienced a strong demand. The demand for citrus, fruit which continued to come on the markets in smaller quantities, exceeded the supply. Moderate consignments of pineapples and papaws were disposed of favourably.

Tomatoes.—Supplies of tomatoes increased on most markets and consequently prices of ordinary tomatoes on the Johannesburg market declined from 2s. 1d. per tray in November to 1s. 11d. per tray in December, and on the Cape Town market from 3s. 4d. to 3s.

Onions.—Larger consignments of onions came on the markets and prices decreased considerably. Prices of Transvaal onions on the Johannesburg market declined from 21s. 11d. to 16s. 8d. per bag; on the Cape Town market from 26s. 11d. to 12s. 4d. per bag; and local onions on the Durban market from 24s. 8d. to 19s. 8d. per bag.

Potatoes.—Still larger quantities of potatoes reached the markets than during the previous month and prices decreased further. Smaller consignments of sweet potatoes were sold at lower prices than during the previous month.

Vegetables.—In general supplies were still very moderate and fairly high prices were realized.

Seeds, Grains and Feeds.—Lucerne hay was offered in large quantities on the Johannesburg market, but teff and oats, particularly of good quality, were scarce. Lucerne prices decreased slightly, but were nevertheless firm.

Eggs and Poultry.—The supply of eggs showed a still further decrease on most markets, and prices were high. Further increases in the maximum wholesale and retail prices of eggs were announced towards the end of December. Supplies on the poultry market were insufficient to meet the strong demand which arose towards Christmas and New Year, and good prices were realized.

* All prices mentioned are averages.

Index of Prices of Field Crops and Pastoral Products.

The above index, which appears elsewhere in this issue, decreased from 204 the previous month to 200 in December, 1946.

The most important changes occurred in the following cases:—

- (a) "Hay" decreased from 165 to 157 in November, particularly as a result of a greater supply of lucerne hay.
- (b) "Other Field-Crop Products", i.e. potatoes, onions, sweet-potatoes and dry beans, decreased from 309 to 236 as a result of a further price decrease in the case of potatoes.
- (c) "Pastoral Products" decreased from 179 to 168 in December as a result of a small decrease in average wool prices.
- (d) "Poultry and Poultry Products" increased from 171 to 200 in December due to a further increase in the prices of eggs and also of table poultry during Christmas.

Review of the Wool Market during December 1946.

During December 1946 a total of 64,310 bales of wool was offered for sale in Union Ports, of which 47,368 bales (74%) were sold.

Good quality wool, particularly spinning and short wools, experienced a strong demand, but inferior types attracted little competition. Sales were generally less favourable towards the end of the month and the average prices were in most cases somewhat lower than those of the previous month.

Maximum Prices of Eggs.

The maximum wholesale and retail prices of eggs in controlled areas as fixed on 13 December 1946 (see "Crops and Markets" of January 1947) have been increased all round by a further 2d. per dozen for each grade as from 20 December 1946.

(See *Government Gazette Extraordinary* of 20 December 1946.)

Maximum Prices of Poultry.

The maximum wholesale and retail prices of turkeys in the Union as fixed on 23 November 1945, and those of other poultry as fixed on 11 January 1946, have been discontinued as from 3 January 1947. (See *Government Gazette Extraordinary* of 3 January 1947.)

Production of Lucerne Hay.

During the past few years lucerne enjoyed a keen demand on account of the scarcity of other hay feeds, grain products, and protein

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rich concentrates. The result was that the constant increase in demand caused prices to advance considerably, as is reflected in the following prices per 100 lb. for Cape lucerne hay on the Johannesburg market during the period 1938-39 to 1945-46.

	s.	d.
1938-39	3	10
1939-40	3	0
1940-41	4	2
1941-42	5	7
1942-43	5	5
1943-44	5	4
1944-45	6	4
1945-46	6	6

The remunerative prices realized largely encouraged the production of lucerne, even in less important centres of production. As no agricultural census was held during the war years, no actual production figures are available for the present season, but the following table reflects the tendency in lucerne hay production during the past few years. The table gives the tonnage of lucerne hay produced in the six most important lucerne hay producing areas in the Union for the 1936/37 season, according to the agricultural census, as well as the consignments by rail of lucerne hay, from the railheads in these areas for the 1944/45 and 1945/46 seasons.

Area.	Production 1936-37.	Consignments by rail 1944-45.	1945-46.
	Tons.	Tons.	Tons.
Orange River..	16,526	88,838	101,668
Oudtshoorn.....	31,540	16,971	38,438
Olifants River.....	12,390	33,799	32,771
Fish River.....	25,633	16,606	4,842
Sundays River ..	15,052	16,616	9,086
Vaalhartz.....	12	18,008	23,908
	101,153	190,838	210,713

Although the date for consignments by rail do not strictly agree with the production figures, it is clear, however, that production in the lucerne areas progressed immensely. The 1936/37 census showed a yield of 240,367 tons for the Union as a whole, of which 101,153 tons came from the areas mentioned above, and according to this proportion the production in the Union can be assessed at near 500,000 tons.

It should also be borne in mind that the consignments could have been far greater in 1945/46 if climatic conditions had been more favourable in the Fish and Sundays River areas.

Lucerne Prices.—The maximum price for lucerne hay remains unchanged as fixed on 16 November 1945, viz. 6s. per 100 lb. for the producer, f.o.r. producer's station, as well as the maximum price at which co-operative societies may sell, viz. 6s. 3d. per 100 lb.

Traders who buy direct from producers must also sell at the same fixed maximum price, f.o.r. producer's station.

In the most important producing areas the maximum price is 6s. 3d. per 100 lb. in all cases, including the producer.

Prices of Baconers and Slaughter Cattle.

Baconers.—In order to encourage the production of baconers, of which the Union has at present a serious shortage, and also to compensate farmers for the rising costs of concentrated feeds, the producer's prices of baconer pigs have been increased under the Meat Scheme with effect as from 23 December 1946 to 1s. 3d. per lb. and 1s. 0½d. per lb. dressed weight for 1st and 2nd grade baconers, respectively. (See *Government Gazette Extraordinary* of 20 December 1946.)

The previous increase in prices of baconers was on 12 July 1946, when prices were fixed at 1s. 1d. and 10½d. per lb. dressed weight for 1st and 2nd grade baconers, respectively.

Prices of Slaughter Cattle.—The upward trend in the prices of slaughter cattle in the controlled areas, which started operating during the middle of June 1946, reached its peak on 28 October 1946, viz. 15s. per 100 lb. dressed weight, and since then prices have remained at that level.

As the general weather conditions were considered fairly favourable, it was decided, after consultation with the Meat Board, to reduce prices gradually, as from the end of December 1946, viz. as follows:—

As from 31 December 1946 by 2s. 6d. per 100 lb. dressed weight for all grades in controlled areas; from 6 January 1947 by a further 2s. 6d. per 100 lb; and thereafter by 1s. per 100 lb. per week till 17 March 1947 when the lowest peak in prices for the season will be reached.

Wholesale and retail prices of meat, of course, remain unaltered.

Maximum Prices of Potatoes.

Due to a greater supply of potatoes on the markets, the maximum prices of potatoes in the controlled areas as fixed on 22 November 1946 were again reduced as follows as from 27 December 1946:—

In the case of potatoes sold direct by a producer to a trader, the maximum prices are 26s. 0d., 25s. 0d., 21s. 6d. and 17s. 0d. per bag (150 lb.) f.o.r. for 1st grade sized, 1st grade unsized, 2nd grade and 3rd grade, respectively.

When the sales take place by auction or otherwise on behalf of the producer by an auctioneer, a market agent, broker or other agent, the maximum prices are 26s. 8d., 25s. 8d., 22s. 2d. and 17s. 8d. per bag, respectively, including commission. Railage may, however, be added to these prices.

In the case of potatoes sold on behalf of a producer by a market agent the maximum prices are 28s. 5d., 27s. 5d., 23s. 11d. and 19s. 2d. per bag, respectively, including railage, commission, transport and other market charges.

For potatoes sold direct by a producer to a consumer in quantities of 150 lb. or more at a time, the maximum prices are 29s. 6d., 29s., 25s. and 20s. 6d. per bag, respectively, f.o.r. producer's station or delivered at the buyer's premises.

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The wholesale price is 29s. 9d., 29s., 25s. 2d. and 20s. 4d. per bag, while the retail price for quantities less than 150 lb. is 9d. per 3½ lb., 9d. per 3½ lb., 9d. per 4 lb. and 7½d. per 4 lb. delivered free of charge to the consumer.

The maximum price at which undergrade potatoes may be sold by any person is 7s. 6d. per bag.

The maximum price at which potatoes outside the controlled areas, other than first grade (sized or unsized) potatoes, may be sold by any person has been fixed at 9d. per 4 lb., while the maximum price at which first grade (sized or unsized) potatoes may be sold by any person is 9d. per 3½ lb. plus the transportation costs per lb. actually incurred by the seller.

For full particulars see *Government Gazette Extraordinary* of 27 December 1946, and for previous prices see "*Crops and Markets*", January 1947.

Agricultural Conditions in the Union during December, 1946.

Rainfall.—Good rains occurred in many parts of the summer-rainfall areas of the Union, particularly in the eastern parts. The rains were, however, of the thunderstorm type and unevenly distributed with the result that many areas received little or no rain. Little rain occurred in the western and northern parts of the Union.

Pastures.—The showers of rain caused pastures to improve, but soaking rains were still necessary to promote rapid growth.

Stock.—The condition of stock was generally fair, especially in parts where rain occurred, but began to deteriorate in the Karoo, while in the northern Transvaal and the Lowveld the continual drought caused stock losses. Lumpy skin disease still occurred in the western and south-western Cape Province, the Border area and the Transkei. In Natal, nagana and Red Water fever caused stock losses, while lumpy skin disease has spread still further.

Crops.—Wheat crops were generally good. The Orange Free State and eastern Cape Province harvested excellent crops. Summer cereal crops were also promising, and although hail caused damage in certain parts of the western Orange Free State and Transvaal, a good maize crop was nevertheless generally expected, provided general rains fell in the main maize areas before the middle of January. In Natal the sugar cane has shown rapid improvement after the rain, although an irrecoverable setback was suffered as a result of the earlier prolonged drought.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Com- bined index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39.....	92	109	96	80	79	102	106	94	93
1939-40.....	86	114	77	95	115	105	106	89	104
1940-41.....	108	120	106	156	102	108	110	103	109
1941-42.....	120	144	143	203	102	131	135	136	124
1942-43.....	160	157	144	159	122	147	168	167	147
1943-44.....	170	180	137	212	122	154	185	188	159
1944-45.....	183	186	160	281	122	177	179	184	164
1945-46.....	201	194	164	312	118	198	185	170	170
1946—									
January.....	198	194	191	347	118	204	188	204	171
February.....	198	194	158	305	118	186	184	224	171
March.....	198	194	160	280	118	186	181	241	171
April.....	198	194	176	298	118	186	180	279	174
May.....	219	194	170	281	119	186	177	289	184
June.....	216	194	178	287	119	218	178	260	184
July.....	245	194	182	303	120	231	183	193	182
August.....	242	194	181	319	120	231	188	164	181
September.....	243	191	183	351	163	231	196	156	198
October.....	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	191	208	171	204
December.....	242	210	157	246	168	194	209	201	200

(a) Maize and kaffircorn.

(b) Wheat, oats and rye

(c) Lucerne and tef hay

(d) Potatoes, sweet potatoes,

onions and dried beans.

(e) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and

condensing milk

(g) Cattle, sheep and pigs.

(h) Fowls, turkeys and eggs.

Average Prices of Eggs and Poultry on Municipal Markets.

SEASON (1 July to 30 June).	EGGS.			FOWLS (Live, each).			TURKEY COCKS (Live, each).		
	Johannes- burg, New- laid. Per Dozen.	Durban, New- laid. Per Dozen.	Cape Town. Per 100.	Johannes- burg.	Durban.	Cape Town.	Johannes- burg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.....	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939-40.....	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940-41.....	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941-42.....	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942-43.....	1 10	2 0	13 5	4 0	4 2	4 8	16 8	16 10	15 0
1943-44.....	2 1	2 2	14 2	5 3	5 3	5 6	16 7	20 6	16 8
1944-45.....	1 11	—	14 10	5 1	5 6	5 9	16 8	18 5	18 7
1945—									
January.....	2 3	2 2	17 10	4 5	5 2	5 6	12 8*	17 8	17 0
February.....	2 6	2 6	19 10	4 7	5 5	5 6	12 0	21 2	15 11
March.....	2 9	2 10	20 5	4 8	5 6	5 7	12 9	12 4	15 6
April.....	3 2	3 2	22 7	5 1	5 10	5 5	13 0	18 1	15 1
May.....	3 3	3 8†	28 0	5 4	4 11	5 4	13 10	14 9	15 1
June.....	3 2	3 5	25 11	5 11	6 1	5 11	13 0	16 7	21 1
July.....	1 10†	2 0	18 5	6 4	6 6	6 2	17 5	15 10	19 5
August.....	1 7	1 6	11 11	6 1	6 8	6 0	18 4	18 9	22 2
September.....	1 5	1 5	11 0	5 6	6 3	6 1	17 10	19 7	24 8
October.....	1 6	1 7	10 11	4 8	5 11	5 8	17 3	20 1	13 8
November.....	1 7	1 8	11 7	4 4	5 5	5 7	15 6	20 1	28 6
December.....	2 0	2 2	14 1	4 5	5 4	5 5	14 0	17 7	—
1946—									
January.....	2 4	2 7	18 3	4 6	5 5	5 6	14 1	14 8	—
February.....	2 8	2 10	20 11	4 3	5 5	5 4	12 0	15 10	—
March.....	3 0	3 2	21 6	4 7	5 9	5 8	12 4	14 3	—
April.....	3 6	3 9	27 2	5 1	5 7	5 6	12 5	12 9	—
May.....	3 6	3 10	28 6	5 8	5 9	5 9	13 9	18 0	—
June.....	2 11	3 2	28 0	6 2	5 11	5 8	15 9	15 6	—
July.....	1 11	2 1	18 2	6 5	6 1	6 1	17 1	17 8	—
August.....	1 7	1 7	12 5	6 4	5 11	6 4	19 2	18 7	—
September.....	1 6	1 6	11 7	5 6	5 9	6 3	18 5	16 10	—
October.....	1 7	1 0	12 3	4 5	5 2	6 1	17 11	17 3	—
November.....	1 10	2 0	14 1	4 5	5 3	6 2	15 3	14 5	—
December.....	2 4	2 7	17 9	4 6	5 4	5 7	15 6	20 5	—

* Prices of Turkeys: Live, each.

† Large, Grade I.

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Prices of Avocados and Papaws on Municipal Markets.

SEASON	AVOCADOS (Per Tray). (a)				PAPAWS. (b)							
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Elizabeth Std. Box.	Bloemfontein Std. Box.		
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.				
1938-39.....	s. d. 1 6	s. d. 0 11	s. d. 1 8	s. d. 1 11	s. d. 2 0	s. d. 0 10	s. d. 1 7	s. d. 2 0	s. d. 2 0	s. d. 1 8		
1939-40.....	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6		
1940-41.....	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9		
1941-42.....	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0		
1942-43.....	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0		
1943-44.....	4 1	1 6	3 7	5 3	3 2	1 5	2 5	3 5	3 3	2 7		
1944-45.....	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0		
1945—												
January.....	8 1	1 8	5 10	9 2	3 10	1 6	4 5	7 11	6 4	3 11		
February.....	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 6	4 7		
March.....	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8		
April.....	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6		
May.....	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2		
June.....	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	6 2	4 0		
July.....	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11		
August.....	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4		
September.....	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11		
October.....	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10		
November.....	8 0	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8		
December.....	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6		

(a) Season 1 January to 31 December.

(b) Season 1 April to 31 March.

Prices of Bananas and Pineapples on Municipal Markets.

SEASON.	BANANAS (Per crate) (a)				PINEAPPLES (b)							
	Cape Town.	Johannesburg	Pretoria.	Cape Town. Box.	Durban. Doz.	Johannesburg.		Port Elizabeth. Box.	East London. Doz. Large.	Bloemfontein. Bushel Box.		
						Ordinary. Doz.	Queens and Glants Doz.					
1938-39.....	s. d. 22 5	s. d. 9 10	s. d. 16 5	s. d. 5 4	s. d. 3 3	s. d. 1 1	s. d. —	s. d. 3 5	s. d. 1 2	s. d. 4 10		
1939-40.....	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9		
1940-41.....	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10		
1941-42.....	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2		
1942-43.....	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3		
1943-44.....	37 8	13 2	18 10	8 3	3 6	2 4	2 1	6 3	2 10	8 4		
1944-45.....	—	—	—	10 4	3 9	2 6	3 9	7 3	3 3	8 6		
1945—												
January.....	31 9	12 11	14 0	7 7	—	1 4	2 2	6 3	2 4	6 3		
February.....	32 8	13 5	16 7	5 11	—	1 5	1 3	5 4	2 7	6 11		
March.....	27 1	13 7	14 8	6 3	—	1 7	2 5	4 11	4 7	5 6		
April.....	34 11	14 10	17 4	7 4	—	2 2	3 5	5 9	2 11	6 4		
May.....	30 11	10 3	13 7	8 4	2 9	3 5	2 10	9 4	2 7	8 2		
June.....	31 5	9 4	12 6	8 10	2 7	5 4	5 9	10 9	4 4	8 6		
July.....	33 11	10 6	19 4	13 2	2 5	7 1	5 6	17 7	3 5	15 3		
August.....	38 1	16 1	16 4	12 9	4 1	5 4	5 9	13 8	3 3	13 11		
September.....	53 7	20 3	13 1	11 7	8 3	5 9	6 2	10 4	5 0	15 8		
October.....	70 8	41 1	33 4	13 1	10 7	7 6	5 8	16 0	4 6	14 1		
November.....	68 0	32 4	25 1	10 10	10 9	4 5	5 0	12 4	4 10	13 6		
December.....	75 11	17 7	11 1	10 7	7 4	3 4	4 6	7 7	5 9	8 5		
1946—												
January.....	81 9	14 4	14 11	10 4	3 0	3 5	3 4	8 7	2 9	9 3		
February.....	54 8	12 0	13 8	8 4	2 9	2 8	4 0	8 5	4 6	9 7		
March.....	69 7	17 3	28 6	9 10	5 9	3 0	3 8	7 1	6 7	11 6		
April.....	75 5	29 5	17 7	11 8	5 7	4 0	5 4	9 5	2 7	9 4		
May.....	76 8	29 8	22 2	7 6	4 6	3 4	3 6	8 3	3 10	8 7		
June.....	77 11	23 5	26 7	10 7	5 0	4 7	4 7	7 5	6 3	12 3		
July.....	60 11	25 4	25 8	15 7	3 2	9 3	10 3	15 5	5 7	13 5		
August.....	72 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10		
September.....	66 5	20 6	30 8	10 1	7 7	6 5	7 2	12 2	4 7	13 11		
October.....	78 10	28 6	34 6	15 5	6 5	6 9	6 5	13 10	4 3	14 5		
November.....	63 8	47 10	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11		
December.....	67 7	30 7	35 4	16 5	4 5	7 0	—	11 11	4 7	17 8		

(a) Season 1 January to 31 December.

(b) Season 1 October to 30 September.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johannesburg (a) 100 lb.	KAFFIROORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (a).		
	Cape.	Trans- vaal.			K1.	K2.	Speckled Sugar.	Cow- peas.	Kid- ney.
1938-39.....	s. d. 3 10	s. d. 3 1	s. d. 4 0	s. d. 2 7	s. d. 13 1	s. d. 12 9	s. d. 25 0	s. d. 16 9	s. d. 24 2
1939-40.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	18 11	21 2
1940-41.....	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	25 3
1942-43.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.....	5 4	5 6	7 8	4 5	21 0	21 7	40 6	29 11	32 1
1944-45.....	6 4	5 4	7 2	4 9	18 8	18 8	38 7	39 6	70 6
1945—									
January.....	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February.....	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 8	69 4
March.....	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 8
May.....	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June.....	7 8	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	—	3 11	40 10	40 10	61 4	35 3	59 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	71 1	36 6	52 14

(a) Municipal Market.

(b) Seasonal year for kaffircorn,
1 June-31 May.

Dry Beans, 1 April-31 March;

Lucerne and teff, 1 July-30
June.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.)						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Trans- vaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannes- burg. Table.	Durban.	Cape Town.
1938-39.....	s. d. 8 3	s. d. 8 10	s. d. 7 4	s. d. 7 10	s. d. 8 6	s. d. 9 6	s. d. 5 7	s. d. 4 8	s. d. 5 3
1939-40.....	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940-41.....	12 5	12 3	9 10	11 11	11 2	12 7	7 8	6 4	5 5
1941-42.....	10 5	13 11	10 4	13 10	13 0	14 3	9 11	7 1	8 4
1942-43.....	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1943-44.....	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1944-45.....	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1945—									
January.....	12 9	13 1	9 11	14 8	12 3	13 5	18 2	7 8	14 7
February.....	13 5	13 10	9 9	10 4	12 2	14 0	16 0	8 1	10 8
March.....	13 10	15 2	11 4	14 9	18 9	17 0	12 6	9 6	12 5
April.....	17 8	17 5	14 6	16 9	12 6	17 8	9 11	7 5	9 1
May.....	16 4	17 11	12 0	18 0	19 11	20 10	10 4	7 1	11 4
June.....	20 8	17 11	14 4	18 4	15 4	18 1	9 4	8 2	9 4
July.....	16 7	18 7	15 5	16 8	17 7	20 5	10 4	8 8	12 4
August.....	18 7	18 4	15 7	18 3	16 9	19 4	11 8	8 9	12 1
September.....	16 1	17 7	16 1	19 11	19 3	20 5	15 0	12 11	14 2
October.....	10 8	14 5	12 11	14 8	10 4	15 10	19 0	15 6	17 0
November.....	12 3	9 3	13 0	—	14 8	13 10	19 11	19 1	21 8
December.....	14 8	15 3	15 6	17 10	16 11	15 7	17 1	14 6	17 7
1946—									
January.....	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February.....	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 8	17 2
March.....	11 4	12 4	9 0	12 10	12 9	13 5	18 0	14 8	14 8
April.....	12 1	12 10	11 3	13 10	15 1	14 0	15 2	17 4	14 7
May.....	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June.....	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July.....	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August.....	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September.....	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October.....	24 9	28 1	32 5	24 0	32 8	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December.....	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 6

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N.B.—

- Applications should be addressed to the Principal of the College concerned.
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FARMING IN SOUTH ... AFRICA

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MARCH 1947

No. 252

Editorial:

Our Soils and the Care They Deserve.

IN recent years the extensive occurrence of that serious menace to our soils, viz. erosion, has received such prominence through the publicity given to it by the Department of Agriculture, the press, the cinema and leading overseas visitors, that the general public, including the urban population, has awakened to the danger threatening the country as a whole, in other words, has become strongly soil-conscious. As our most important natural asset and the source of our national prosperity, the soil deserves our most devoted care. It provides the food required by the country's population and must continue to do so if we are to remain a civilized country with any degree of self respect. Our soil is undoubtedly the foundation of national survival.

Soil consists largely of the outer disintegrated layer of the earth's crust, changed in the course of many centuries to the final product composed of broken stone, disintegrated rock and organic matter or humus. This final product, the soil, forms the soft seed-bed for plants; it is the anchorage and food store of the vegetable kingdom and the seat of change and transformation.

It teems with life and is the source of all new plant growth. The soil can therefore no longer, as in the past, be regarded as lifeless dirt.

Things grouped together under the same general heading, do not necessarily possess similar or common characteristics. This is also true of soils. The properties of sandy soils, for example, and the treatment necessary for profitable yields, differ widely from those of clayey soils.

Every tiller of the soil, whether farm owner or occupier of an erf in town, owes it to himself and his greatest asset, the soil, to learn as much as possible about soil in general and his own in particular. The extent of this knowledge will depend on the purpose for which the soil is to be used. The more intensive the cultivation, the more complete the information will have to be.

Soils intended for irrigation, for example, must be carefully inspected before the owner proceeds to incur the expense of building a reservoir and canals. The cost of inspecting the soil is negligible compared with the cost of irrigation works, which are often doomed to failure because of the presence of one or more unfavourable factors. For that reason it is the policy of the Government that no irrigation schemes shall be undertaken unless previous inspection of the soil irrigated has proved that irrigation will be justified.

In the examination of such soils, attention is paid mainly to their physical and tilling properties; the natural fertility of the soil is of minor importance since this can always be supplemented by fertilizer or improved by rotational cropping. The main object to be borne in mind, whatever the degree of original fertility, is that the needs of the crops must be met. In this way soil fertility

will be built up and maintained. Raising crops on the reserve of plant nutrients in the soil will lead to soil piracy, which cannot be tolerated or encouraged in any circumstances.

Examining the soil before launching the irrigation scheme does not preclude the possibility of failure.

Waterlogging and the attendant problem of increasing brackishness are very common difficulties, and may be caused by various factors, and consequently the reclamation of this type of soil may be very simple or very difficult and costly. In the latter case, the information gained from the original examination will be of great value in determining the cause of the difficulty and in finding a control measure.

Soils under irrigation schemes are not the only types requiring careful examination. The same attention should be paid to farms subdivided into agricultural holdings and sold as such.

In addition to a knowledge of soils suitable for irrigation or agricultural plots, the farmer should also have a knowledge of arable soils suitable for dryland cultivation and of non-arable soils. Their characteristic properties such as soil reaction, texture, structure, water-absorption capacity, drainage, erodibility and fertility, individually and collectively play an important rôle in crop production and soil destruction.

In the present circumstances farmers should do their utmost to learn more about their soil. The Government has not as yet been able to undertake a systematic survey of all the soils in the Union. The available organization deals exclusively with Government irrigation schemes and other important soil examinations. Once a detailed systematic soil survey of the Union has been made, it will be easier for the public to acquire the necessary knowledge. In a survey of this type all the necessary information relating to soils or soil types in the Union will be collected, viz. the productivity of the soils, the crops which thrive on them, topography, soluble salts, soil reaction, stony nature, the type of farming which is being or may be practised and the prevailing climatic conditions. Maps will be made available showing the physical properties of the various soil types, and supplementary reports will contain detailed descriptions of the soils as well as their possibilities. Once this has been accomplished, the agriculturist or prospective farmer will be enabled to become acquainted not only with the top-soil of his farm, but also with the subsoil and the subterranean strata as well as their requirements in respect of plant nutrients.

There will no longer be any excuse for the landowner who farms on soil with its wrong side up; in other words, with all the information at his disposal, the farmer will desist from ploughing non-arable soils on areas where climatic conditions make crop cultivation unprofitable.

It is hoped that not only *every* farmer but also *every* inhabitant of South Africa will become soil conscious. Those dealing directly with the soil should realize betimes the value of soil knowledge obtained through this type of survey. Soil should be gratefully and lovingly treated as an independent, natural living body and not as so much dirt.

Soil consciousness developed in this way, will lead to more real interest in our soil and to proper soil utilization instead of soil exploitation.

(Dr. C. R. v. d. Merwe, Division of Chemical Services.)

Cultivation and Harvesting of Groundnuts.

J. Sellschop, College of Agriculture, Potchefstroom.

GROUNDNUTS are a crop that must be well cultivated and kept free from weeds. This can be accomplished by harrowing and cultivation before the seed is planted and when the plants are still very young. If these operations are delayed, a considerable amount of hand-hoeing and weeding may have to be resorted to, and the moving of soil from the middle of the rows towards the plants is made more difficult and less effective.

Harrowing.

High, light, spike-tooth harrows, weeders or fast moving rotary hoes may be drawn across the rows from three to four days after planting until the plants commence to flower. Harrowing should, however, not be undertaken until the plants have wilted somewhat



FIG. 1.—Farm-made lifter for a single row of groundnuts.

during the warmer part of the day, otherwise the more turgid ones may be readily broken. How often a crop should be harrowed, will depend on the weed growth in the rows and whether soil crusts affect the emergence of the seedlings.

Cultivation between the rows may commence as soon as the seedlings are visible. When it is no longer possible to use a set of harrows, a weeder or rotary hoe may be used very effectively. Most cultivators used for the cultivation of maize are suitable for the cultivation of groundnuts.

Ridging.

Since the nuts mature in the soil, it is often presumed that the plants should be banked, earthed or ridged up as much as is generally done in the case of potatoes. This is not necessary. It may even be harmful to either the valuable foliage or the shallow root system of the groundnut plants, particularly when the earthing-up is carried out late in the season in closely planted rows. All that is necessary is that with each cultivation a small amount of soil should be worked towards the sides of the plants. This should create a sloping hollow

between the rows for drainage and bring extra earth around the plants for the easy penetration of the developing nut stalks. The moving of soil towards the plants is of greater importance in heavy than in light soils.

Harvesting.

As the groundnut plant does not bear all its flowers at the same time, all the nuts, even on a single plant, do not mature simultaneously. Hence, while some of the oldest kernels may be fully mature and even sprout in hot moist weather, many will still be immature. It is essential, therefore, that plants in different parts of a field be examined at intervals of, say, two to three days. The crop can then be taken out of the ground as soon as it is evident that damage by sprouting or foot-rot (*Sclerotium rolfsii*) may be



FIG. 2.—A cocked or stacked crop.

extensive if the plants are not harvested immediately. In most instances lifting may commence when the inside surface of about a quarter of the nuts has turned brown. By this time the leaves generally assume a yellowish appearance. In order that valuable hay may be saved, and to permit of easy handling of the plants, they should be lifted before they are killed by frost, or before the soil dries out to such an extent that they cannot be readily pulled or ploughed out of the heavier types of soil.

Lifting.

Small areas of groundnuts on light soils may be pulled by hand. Large areas may be ploughed out by means of a light single-furrow plough. In the case of the larger single-furrow plough it will be necessary to remove the mouldboard.

For extensive plantings special groundnut diggers or lifters will be found more useful. Until recently groundnut producers have constructed their own lifters, but several types of single and double-row lifters are now obtainable from agricultural implement manufacturers and merchants. The essential part of a lifter is a broad blade, share or cultivator tine point, run at a depth of 3 to 5 inches below the surface of the soil which cuts the greater portion of the root system of the groundnut plants and works them out of the soil. For the lifting of one row of plants at a time, an implement fashioned after a heavy single-row five-staggered-tine cultivator is used. The two rear tines are joined together by means of a broad blade, while the bottom ends of the two front tines are curved backwards to act as stabilizers and to regulate the angle and depth at which the blade cuts.

Two or more rows may be taken out at a time by means of special cutting points or blade attached to or between the heavy tines of the high-wheeled types of cultivators.

Hand or power-lift digger-lifter attachments consisting of special blades, converted cultivators or lifter-ploughs may be attached to tractors.

If carefully operated and adjusted, different types of potato diggers will also be found useful for the lifting of groundnuts, provided the stand is not too weedy, and fast draught is used.

Gathering and Stacking.

The methods to be followed in gathering and stacking the plants will depend on the size of the crop, local practice, implements and labour available, weather conditions and the quality required in the hay, unshelled nuts and kernels.



FIG. 3.—Groundnuts being threshed.

Not more than the quantity of plants that can be gathered and stacked in a day should be lifted at any time. They should be preferably be allowed to wilt for an hour or two before they are gathered and packed into small stacks. The small stacks or cocks are made more or less as follows. First, mounds of earth about four to five feet in diameter and, say, about four to six inches high, are thrown up with spades. The person packing the cock stands on the mound and packs the plants in a circle around his feet in such a way that the nuts and roots point inwards and the foliage towards the rim of the low mound. When the packed plants come to about knee-height the packer steps out of the hollow cock, and tapers off and closes it at a height of about four to five feet. A few inverted groundnut plants may be placed on the top of the cock. The method outlined merely serves as an indication of how a cock may be built. It may be varied according to the fancies of individual groundnut growers. On account of the scarcity of timber and trouble from ants, groundnuts are seldom packed around poles, as is generally the case in the United States.

Provided dew and rain have dried off before stacking takes place, groundnut plants may be stacked in a much less wilted or dried-out condition than cowpea and soybean plants. The cocks should, as far as possible, not permit rain to enter easily. In areas where foot-rot is troublesome, particular care should be taken not to stack the plants in a moist condition, allow the stacks to become wet inside, or to leave them in the field long after the nuts have cured sufficiently to be fit for picking.



FIG 4—Baled groundnut hay

The plants may also be gathered by means of ordinary hay-rakes or side-delivery rakes. They can then be left in the windrows until they are packed into small stacks. Should the windrows be fairly broad and weather conditions permit, the plants may even be left in them until they are sufficiently dry to go into large stacks or be taken to the pickers. Under these conditions, however, a considerable amount of hay is likely to be lost, while the pods may become very much discoloured and some of the kernels will split readily or be shrunken.

Picking.

The nuts are picked from the plants when they can be pulled from the peduncles, or nut stalks, without short coarse threads breaking from the pods or shells. By this time the kernels generally rattle in the pods and have a nutty flavour. Depending on the state in which the plants are stacked and the weather conditions that prevail from the time of stacking, the curing or drying in the stacks takes from two to six weeks.

The picking may be done by hand or by means of special picking machines or groundnut threshers. It is recommended that the small stacks be taken off the field for picking, thereby saving a considerable amount of good quality hay. There is then also less likelihood of fields becoming systematically infected with the groundnut foot-rot fungus that may frequently be found growing in the debris left wherever a stack has been picked. Whether the

crop is picked by hand or machine, nuts and plants of different qualities should, wherever practicable, be dealt with separately.

Sand and trash should be kept out of, or be removed from, the picked nuts, as the amount of foreign matter present in a consignment is generally determined and deducted from the total quantity



FIG. 5.—After the threshing of the groundnuts—the nuts bagged and the hay baled.

delivered for sale. Trash in particular may adversely affect the kernel content determination of the nuts when they are graded.

Pickers of different makes are imported into the Union from time to time by agricultural implement merchants.

Producers of groundnuts who are considerable distances from central shelling facilities would do well to undertake the shelling of their nuts, as the railage on unshelled nuts is considerably higher than on shelled kernels. There is also a greater demand to-day for shelled than unshelled groundnuts. Small and large shellers or decorticators are being built in the Union.

Particulars regarding the disposal of the 1946-47 groundnut crop will be announced in the press.

The Lay-out of a Piggery.

E. D. Adler, Division of Soil Conservation and Extension, Pretoria.

CLIMATIC and farming conditions in South Africa vary greatly in the different districts.

There are also various methods of pig farming: some farmers may breed pedigree pigs, while others are purely commercial porker and baconer producers. It is thus impossible to give a lay-out which will suit all conditions.

There are however, three main systems of pig production, e.g. (1) the intensive, (2) extensive or free range, and (3) semi-intensive, or a combination of (1) and (2).

The intensive system is one where the pigs are kept in a limited space and confined to the sty.

Owing to the danger of measles, the free-range system has limited possibilities in our country with its large native population.

The semi-intensive system generally suits the average farmer who desires to carry on a pig-production proposition which will fit in with the rest of his mixed-farming activities.

Whichever system is applied, the lay-out of the piggery requires careful consideration.

Choice of Site.

Choose the best site. Some people have the mistaken idea that pigs must necessarily be placed in the wettest and most low-lying locality, as for instance in a vlei. Nothing could be further from the truth. Choose a site which is well-drained, well-sheltered, cool in summer and as warm as possible in winter—the sort of place where you would not mind building your own house.

Sties should be built to face the direction from which the least cold winds come and in such a way that the greatest benefit can be obtained from the rays of the sun during winter. In most parts of South Africa a north or north-eastern aspect is desirable.

If there is a choice of soil type, it is best to choose a coarse sandy loam or even a gravelly soil. A very heavy clay soil is not desirable.

The position of the piggery in relation to the farmyard, feed and water supplies, dairy, etc., must be considered.

A piggery hidden away in a remote and at times almost inaccessible place will seldom be an asset to the farmer. The saying that "the eye of the master fattens the kine" is true also for pigs.

The lay-out should be such that working costs are kept at a minimum, and the possibility of expansion at a later date should be borne in mind.

Type of Buildings.

Elaborate buildings and expensive materials are not necessary. Use suitable material which is most plentiful and easily obtainable in your particular area. For example, thatch is often cheaper than corrugated iron for roofing. In very hot areas thatch is often preferable to iron for this purpose. Stone or split poles may sometimes be used for the walls of shelters instead of bricks or corrugated iron. Whichever system of lay-out or whatever materials are used, particular attention must be paid to the construction of the farrowing pen. The most important factor in economic pig production is the sow's regular farrowing and raising of sufficiently large litters. A sow must be absolutely comfortable during, and for a few weeks after, farrowing. If she is placed in a pen which is cramped, too cold and wet or too hot and stuffy, she will be restless and will

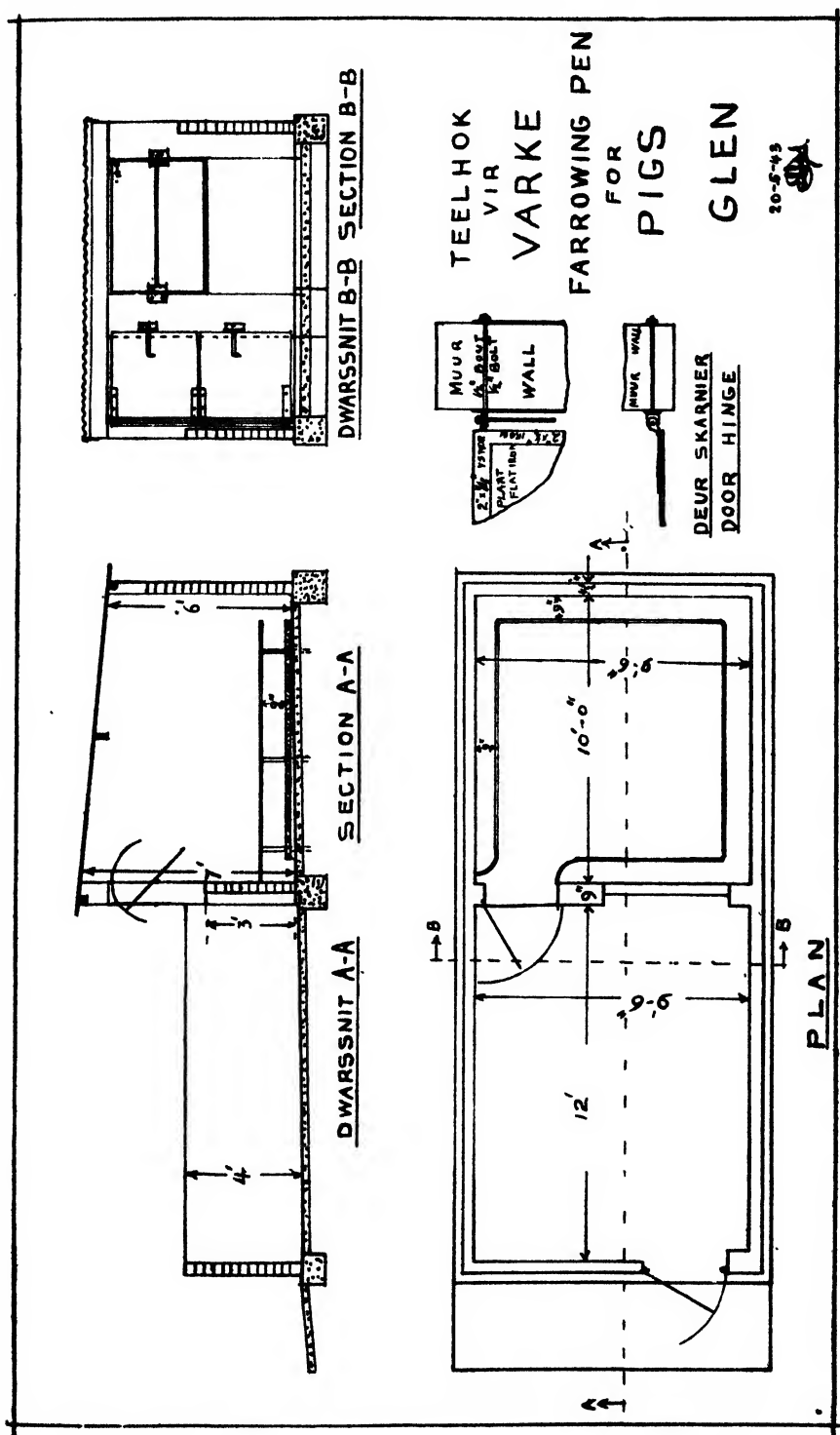


FIG. 1.—Plans of a farrowing pen.

probably lie on, and kill, most of her litter during the first three days after farrowing.

It is suggested that the farrowing pen be constructed as illustrated in fig. 1.

This type of pen can be used under any system. The floors must be made of cement-concrete and sloped to an outside drain so that washing and disinfecting can take place regularly.

Unfortunately such a concrete floor is often excessively cold. If too large a quantity of bedding is provided, the new-born piglets may be too weak to get out of the hollow made by the sow and are easily killed when the sow changes position. It is therefore recommended that in very cold areas the farrowing pen be provided with a false board floor. This board floor is made in two sections, which can be lifted and removed when the house is to be washed and cleaned. This wooden floor should occasionally be put outside to dry and treated with substances such as carbolineum and tar.

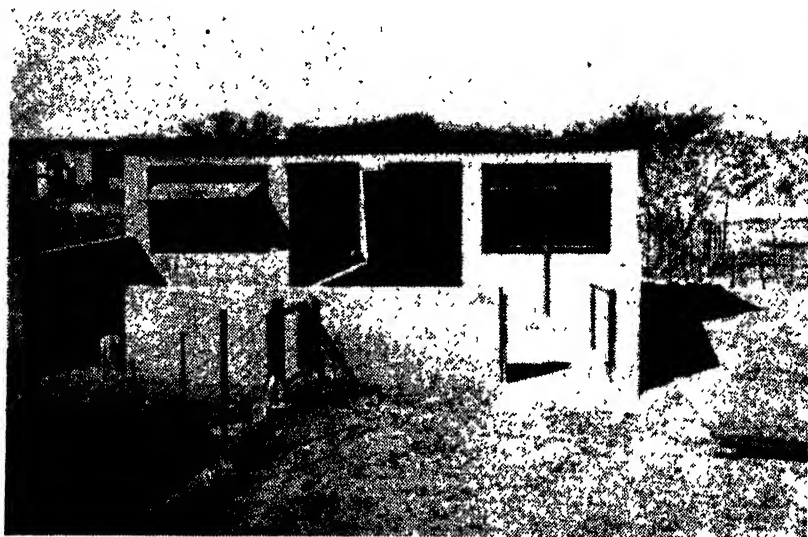


FIG. 2.—Ideal farrowing houses, showing board floors outside for cleaning.

The fact that a minimum of bedding is required with such a false board floor, is a great advantage.

The roof of the farrowing house in particular, and of all pens in general, should not be so low as to necessitate stooping and crawling to get under it in order to handle the sow and piglets, or to clean out the sty. Such low-roofed hutches are generally dark, damp, dirty, badly ventilated, and too hot in summer or too cold in winter.

In very warm areas, or where sows are allowed to farrow only during summer, the upper door and swivel window of the farrowing house, as shown in figs. 1 and 2, are not essential. On the other hand, if violent rain storms are experienced, the door and window are often very useful.

Note that the farrowing pen is supplied with a farrowing rail which must be 9 inches from the wall and 9 inches from the board floor. This rail can be made in portable sections, and need not necessarily be a fixture.

The lay-out of the piggery and types of buildings to construct will depend on the system of pig-farming.

THE LAY-OUT OF A PIGGERY.

A few examples are given:—

The Intensive System.

Fig. 3 is almost self explanatory.

The farrowing pens should be constructed as already explained and illustrated in figs 1 and 2, with the exception that a door is made in the back wall of each pen so that the pigs can have access to an exercise yard. In hot areas a wallow and a few shady trees in this yard are ideal.

The other sleeping pens do not require the swivel window or door between sleeping pen and feed yard, and can be made as large as desired.

The stud breeder who wishes to give special attention and feed to small groups of animals of different ages, sexes or breeding, will need to construct a large number of relatively small pens. The

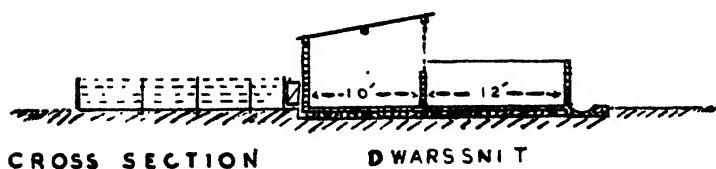
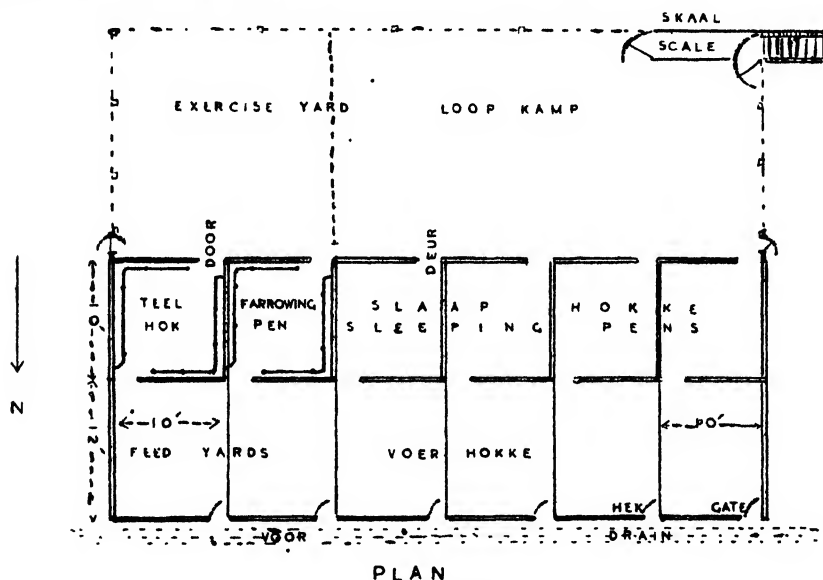


FIG. 3.—Suggested lay-out of piggyery (intensive system).

commercial farmer who caters for the porker and baconer markets may find relatively larger pens more useful. It is inadvisable, however, to make these pens too large. Even where pigs are fattened on a very large scale, it is advantageous to have sufficient pens so that animals can be grouped and fed according to age, size and condition.

A pen of 10 feet by 10 feet is the most useful and can be used for farrowing or other purposes. As many as 14 dry sows or 18 baconers can be housed in such a pen, allowing 1 square feet of floor space per

sow, or $5\frac{1}{2}$ square feet per baconer of approximately 200 lb. live weight.

Each pen should drain separately to a shallow outside drain. The drain should not run through a series of pens because this may cause an accumulation of insanitary material in the lower pens.

Feed troughs are not shown in figs. 1 and 3. If desired, troughs for water and food can be built-in along the walls of the feed yards. In the feed yard of the farrowing pen a special creep can be constructed so that the piglets can have free access to a self-feeder or an open feed trough, while the sow is excluded. Piglets can thus receive extra or special feed.

Such a creep consists of three guard rails, the lower one 10 inches from the floor, the middle one 8 inches higher and the top rail another 8 inches higher up.

The Semi-intensive System.

The lay-out of a typical semi-intensive pig-farming proposition is shown in fig. 5. This system is elastic and can be modified and used to suit the greatest variety of South African conditions.

Here again, a type of farrowing pen, as illustrated in figs. 1 and 2, is advised. Two such pens are built next to each other under one roof, thus saving building material. These farrowing pens are marked A in fig. 5.

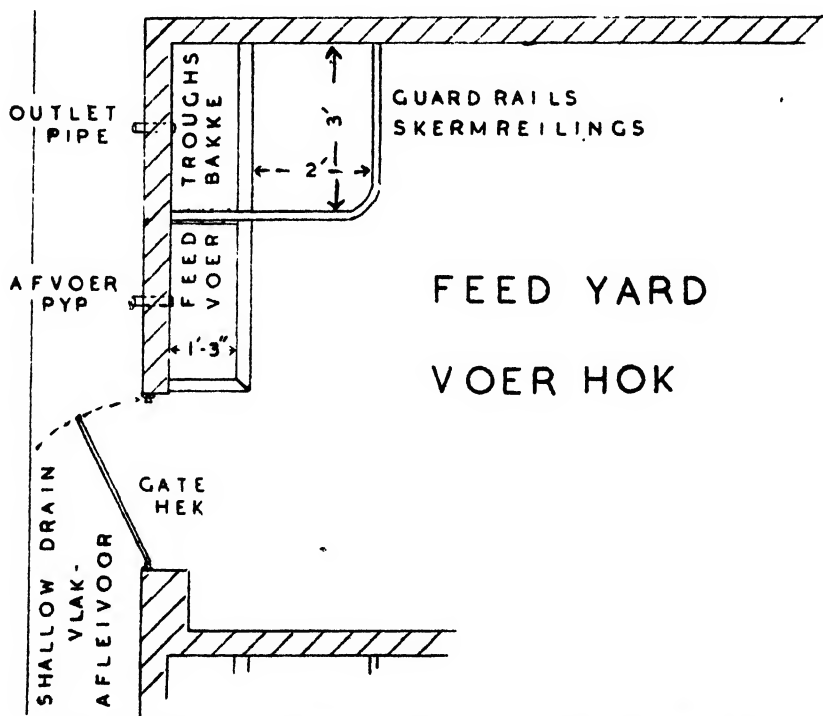


FIG. 4.—Plan of creep and built-in feed troughs in feed yard.

The shelters, marked B, can be fixed or portable. Fig. 6 illustrates a very useful type which can be constructed very cheaply where timber and thatching grass are plentiful.

Portable shelters can be made of wood, or of wood and iron. Portable houses made from wood and corrugated iron are shown in fig. 7.

A farm with a series of paddocks, as illustrated in fig. 5, is preferable to a similar-sized farm with a smaller number of larger paddocks.

The number of farrowing pens in relation to the size and number of other paddocks will depend mainly on the way farrowing is regulated. If all the sows are allowed to farrow in a bunch, then as many farrowing pens as sows are required. If, on the other hand,

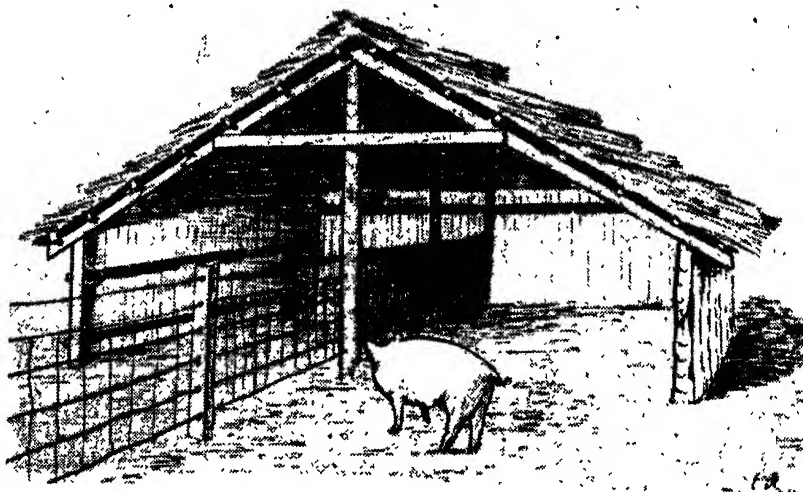


FIG. 6.—A useful type of shelter.

farrowing is arranged in such a way that sows farrow at intervals all the year round, then one farrowing pen can easily do for four sows per year.

With a lay-out such as that illustrated in fig. 5, one could keep 24 sows if farrowing is regulated properly.

If sows are to farrow all the year round, it will be advantageous to have two more spare camps so that the weaner, porker and baconer camps can be rotated.

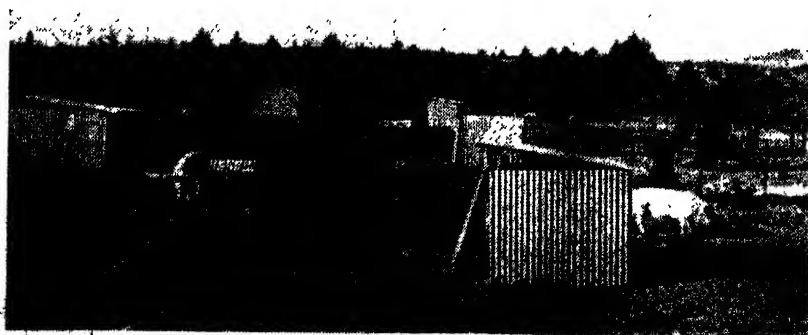


FIG. 7.—General view of a semi-intensive pig farm, with permanent brick farrowing house in the background and portable corrugated iron houses in the foreground.

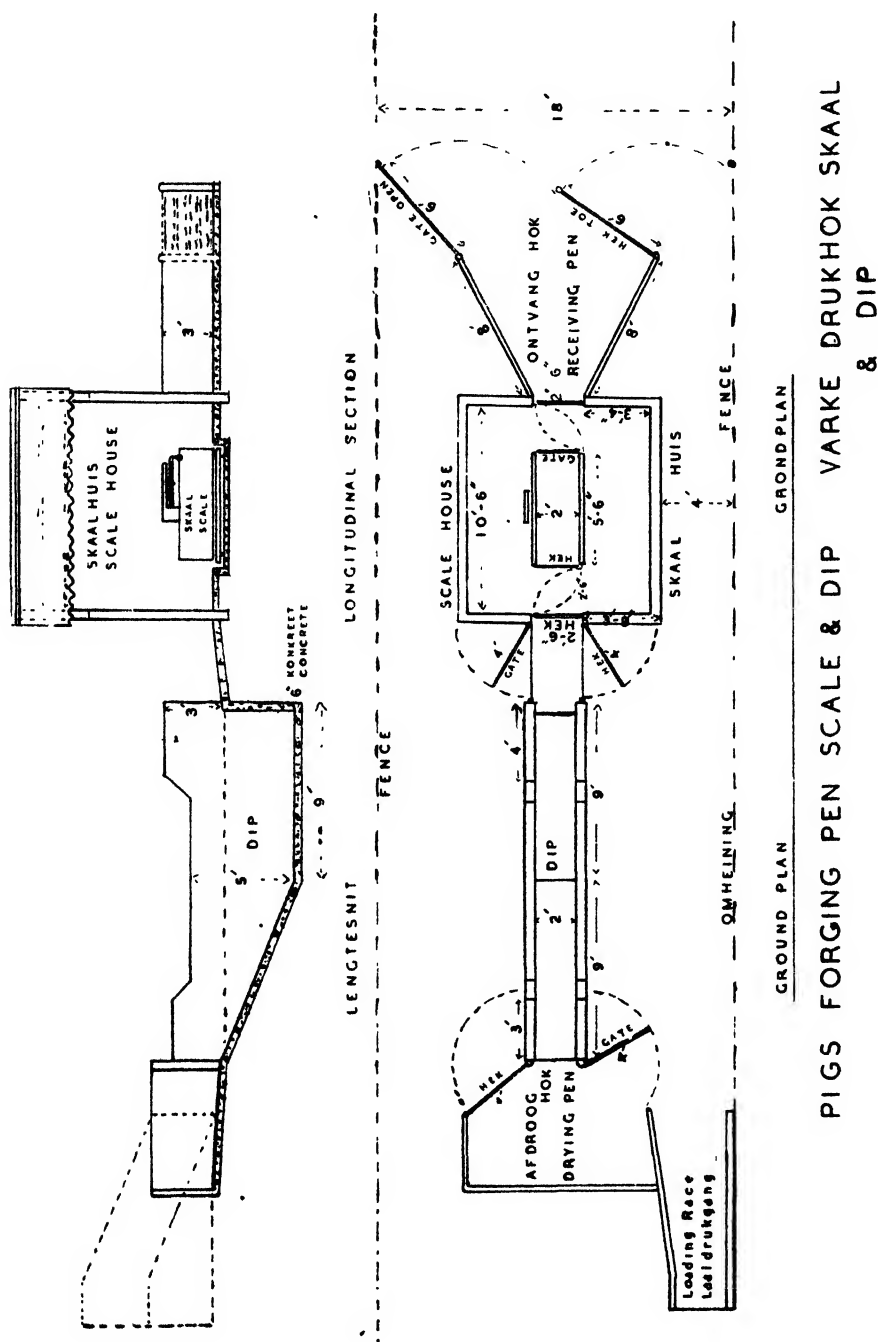


FIG. 8.—The weighing box is a strong crate open at the top, 5ft. 6 inches long, 2 ft. wide (inside measurements) and 2 ft. 6 inches high. It is made to stand on the platform on the scale. The scale is placed in a shallow pit so that the platform is level with the floor. The 2 ft. 6 inches gates of the crate swing out and the 2 ft. 6 inches doors of the scale house swing in towards the crate. Thus, when the crate gates and scale house doors are open, a gangway is formed. In Fig. 8 these gates and doors are shown closed.

Fleas are often troublesome in summer, and regular dipping must be resorted to. The 18-ft. swing gates, as illustrated in fig. 5, facilitate the handling of the pigs with a minimum of labour.

Fig. 8 shows details of a forcing pen, scale house and scale, dip and loading race.



FIG. 9.—Pigs in forcing pen prior to entering the scale house.

Note that in figs. 8 and 10 there is a slope from the scale house to the water level of the dip. The fall should be at least 6 inches to prevent the splash from the dip flowing into the scale-house.

Similarly the floor of the drying pen should slope back towards the dip.

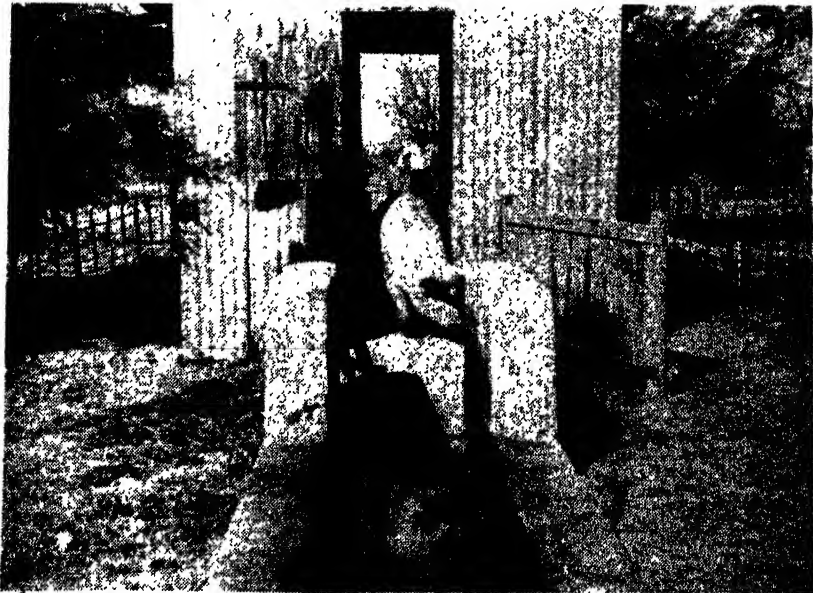


FIG. 10.—Pig emerging from scale house after being weighed.

THE LAY-OUT OF A PIGGERY.

Troughs.

Troughs can be fixed or portable. Portable feed and water troughs must be light enough to be handled by one or two labourers, but must be heavy enough and constructed in such a way that the

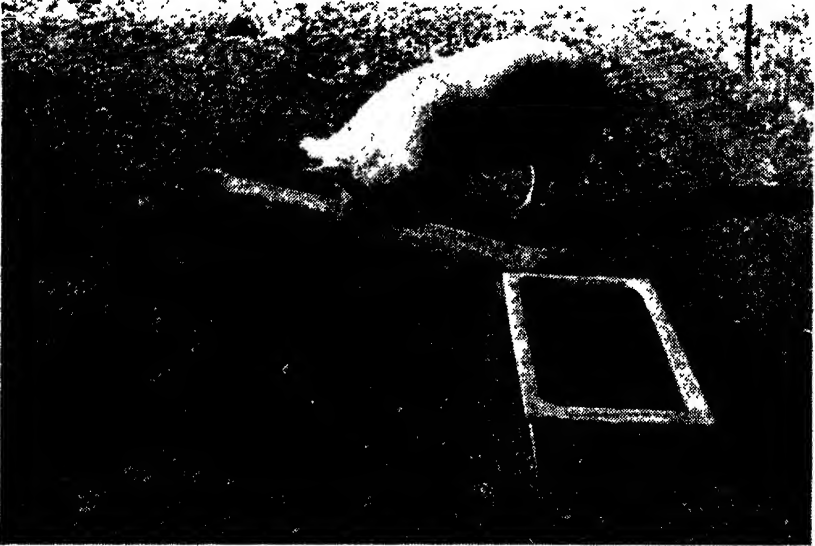


FIG. 11.—The water-trough is 18 inches wide, 9 inches deep and $3\frac{1}{2}$ feet long (inside measurements).

pigs cannot upset or overturn them. In intensive houses troughs are generally built-in. Feed troughs should not be more than 6 inches deep. Water troughs should be deeper.

In fig. 11 a pig is shown feeding out of an iron railway sleeper, while a concrete water trough is shown in the foreground.



FIG. 12.—Portable circular steel feed trough.

In fig. 12 is illustrated a portable circular steel feed trough, the dimensions and construction details of which are shown in fig. 13.

Where permanent feed or water troughs are erected outside the pen and in a camp, precautions must be taken to prevent trampling out of the soil around the troughs. It is advisable to have a space of about 5 ft. around the troughs flagged with stone grouted in cement.

Troughs can be made from various materials. For example, an old motor tyre cut in two along the circumference makes two useful feed troughs. Farmers do not lack in ingenuity, and the construction of suitable troughs from available material should not offer any difficulty.

Fencing.

A well constructed fence is the cheapest in the long run. Good quality pig netting, 2 ft. wide, is generally used. Barbed wire should be spanned 6 inches above the netting and also at ground level.

To prevent pigs from rooting under the fences, heavy stones or logs can be partially buried below and on the inside of the lower strand of barbed wire. Where large stones or logs are scarce, but

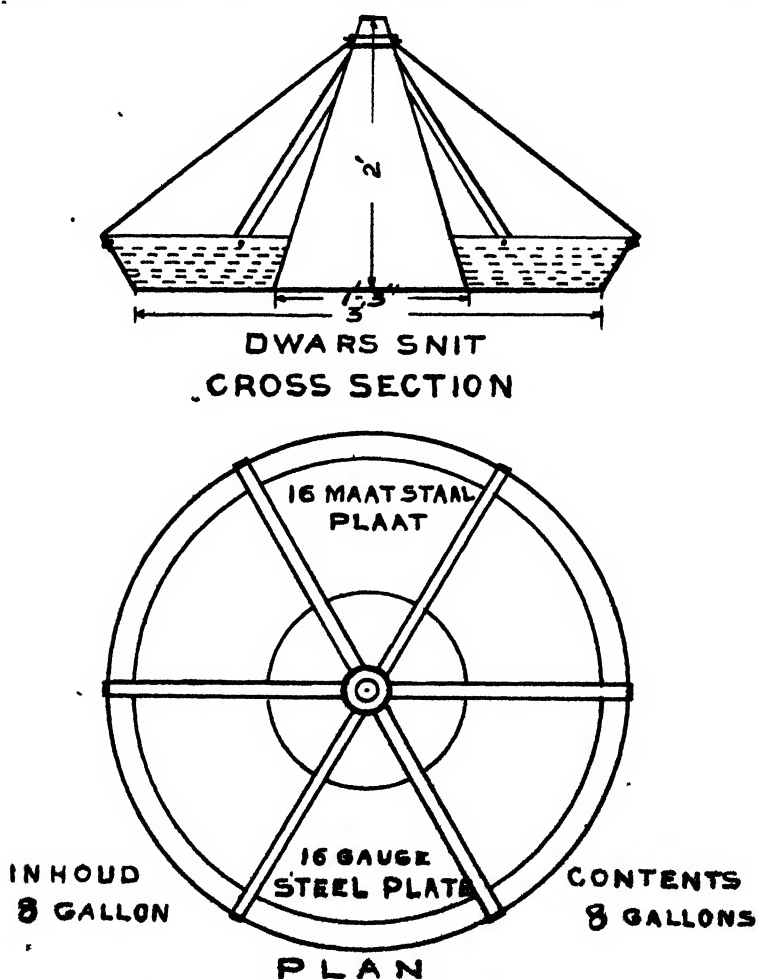


FIG. 13.—Plans of circular steel trough for pigs.

THE LAY-OUT OF A PIGGERY.

material for making concrete is relatively cheap, a good plan would be to dig a trench 6 inches deep and 6 inches wide, or a V-shaped trench 6 inches deep, and to fill the trench with concrete, reinforced with a strand of wire. The trench must be dug before the fence is erected. The concrete can be put in after the fencing posts have been placed in position. At regular intervals thick wire eyelets should be embedded in the concrete so that the concrete slab can be tied to the lower barbed-wire strand.

Shade.

In hot areas, especially under the semi-intensive system, shade during summer is essential for the well-being of the pig.

Not only do trees afford shade, but they enhance the appearance of the farm. If a few trees are to be planted in each camp it would be best to plant them next to the fences. A willow or poplar tree near the water trough serves the dual purpose of giving shade and



FIG. 14.—Tree protected by bits of corrugated iron.

of utilizing water when troughs are drained and cleaned.

To protect a tree, drive in three or four ordinary iron fencing standards to form a triangle or quadrangle around the tree. Just below the surface of the ground place any old iron standards, heavy iron poles or concrete slabs and tie these to the upright standards and to the pig netting and barbed wire fencing. This prevents the pigs from rooting underneath the protective fencing.

The Wallow.

Another aid to the comfort and well-being of the pig is the wallow. If properly constructed, it need not necessarily be a source of contamination and infection. On the contrary, by having a thin layer of motor oil on the surface of the water in the wallow, it can assist very effectively in the control of fleas and some other external parasites.

A wallow which has given good results at the Vaal-Hartz Experiment Station is illustrated in fig. 15.

The wallow must not be too full and the overflow must be controlled. If the wallow is constructed in a camp, as in the case of a

semi-intensive system, due care must be taken to ensure that the overflow does not collect round the wallow, because then the pigs will make their own wallows in the mud, and the whole structure may be undermined.

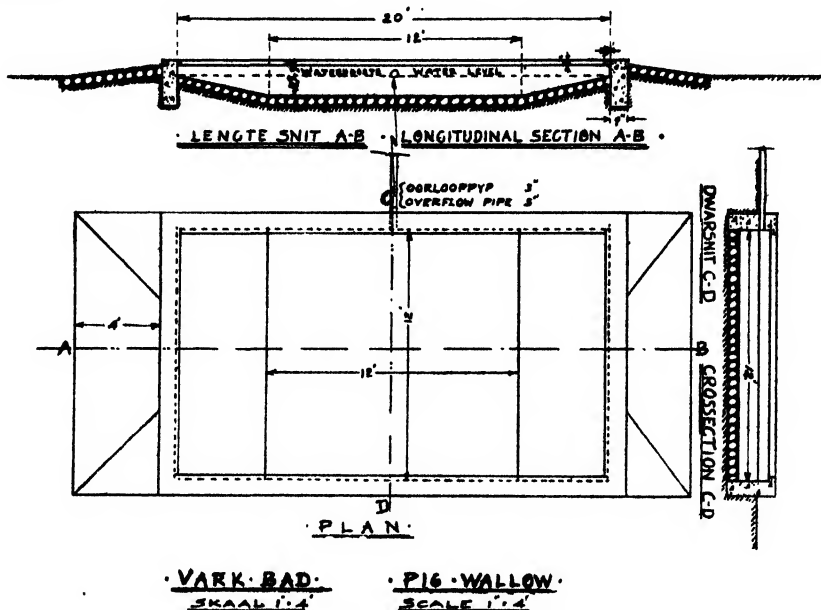


FIG. 15.—Plans of pig wallow.

Isolation or Quarantine Pen.

It is strongly recommended that a separate isolation pen be erected some distance away from the piggery. Sick animals can be treated there. On arrival, animals purchased or obtained elsewhere, must always be placed under quarantine. They should be washed, dosed for worms and left in the isolation pens until there is reasonable certainty that they are clean and free from disease. Needless to say, drainage from such a pen must be away from the rest of the piggery. An isolation pen should be constructed similarly to the farrowing pen illustrated in fig. 1.

ACKNOWLEDGMENT.

The writer wishes to express his thanks to Mr. M. J. D. Steyn, Engineer, for supplying the drawings of figures 1, 13 and 15, and to Mr. C. H. Döhse, Soil Erosion Engineer, Glen, for his advice and co-operation.

New Bulletins.

The undermentioned Bulletins have recently been published:—

Bulletin No. 260., Nutrition of Poultry, Price 6d.

Bulletin No. 264., Turkeys, Price 3d.

These Bulletins are obtainable from the Editor of Publications, Department of Agriculture, Pretoria.

The Horse on the Farm.*

V. (a) General Outline of Feeding and Management.

Dr. P. J. v. d. H. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

PROBABLY our greatest shortcoming in the use and propagation of draught and other utility horses is the inadequacy of our methods of maintenance and management. The draught horse must be considered a machine that can only perform its work when supplied with the necessary "fuel".

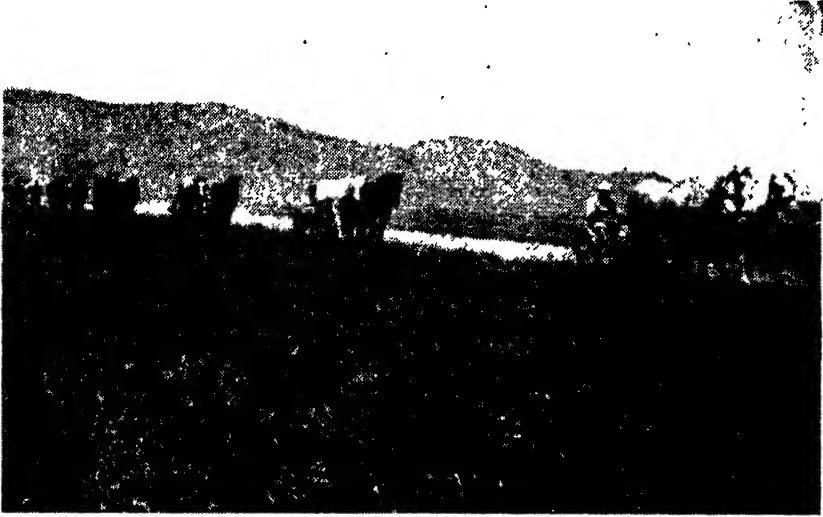


FIG. 1.—Brood mares mowing dryland lucerne.

South Africa produces a large amount of surplus grains, some of which until recently could only be disposed of profitably when bolstered by subsidies. With a better organized cropping system a larger amount of oats—horse feed par excellence—can be produced in a well-planned crop rotation system not only to the benefit of work horses, but also to the farm as a whole. Oats and maize are standard grains for horses in the greatest horse-breeding and horse-using countries. Maize is our main crop and with a steady demand for oats there should be a ready supply of this excellent horse feed, which can be grown practically wherever horses are maintained.

Well-fed and well-cared for horses and mules are economical sources of tractive power on farms and in towns. Well-balanced farming operations with a good system of crop rotation where all or a large percentage of the crops are fed to livestock, will find horse power cheapest and most efficient, for it can be employed throughout the year. Good farming methods in which attention is paid to suitable rotations, intensive farming propositions, the maintenance of soil fertility and a convenient farm lay-out, are naturally and profitably associated with good horses. In such propositions, not only are horses better fed, but the soil is better tilled and more productive.

* The first, second, third and fourth articles in this series appeared in the September, October, November and December (1946) issues of *Farming in South Africa*.

Since about 50 to 70 per cent. of the cost of horses is chargeable to feed, intelligent feeding will considerably reduce the cost. Skilful feeding not only determines the thriftiness and usefulness of horses, but also their length of useful life.

Breeding and feeding go hand in hand. If the science of breeding is to advance, the feeding of stallions, mares and young stock must keep pace with the improvement in breeding hygiene. If this is not the case, little actual improvement or progress can be realized.

The skilful user or breeder of horses feeds for long-term efficiency, i.e. he aims at feeding with cumulative effect. Meat animals such as steers, fat-lambs and baconers are fattened off during short periods, but the horse must be fed for the service he will render over a considerable period. Long-term efficiency rather than temporary economy should be the aim in the maintenance of good horses.

Important Points in Feeding.

In feeding, the following should receive careful consideration:—

Home-grown feeds.—These must meet the requirements of an adequate ration. If this is the case, they are cheapest and best.

Wholesome feeds.—Idle horses can utilize large amounts of cheap, coarse feeds, provided they are of good quality and wholesome, e.g. good veld-grass hay, teff and legume hays.

Horses are very susceptible to digestive disturbances if given unsound feeds. Heaves and even colic are caused, sometimes with fatal results. Avoid feeding dusty, mouldy, musty or otherwise damaged feeds to horses.

The ration to suit the work.—Hard working horses should be well fed, but as soon as the horses do light work or are idle, the ration must be adjusted, else there will simply be a waste of feed and often digestive disorders that may result in serious illness such as laminitis, azoturia and even founder.

Individual needs.—Horses vary more in their individual feed requirements than other farm stock—age, temperament, type of horse and kind and amount of work, as well as the season, all influencing their needs.

Variety of feeds.—An adequate ration must above all contain a sufficiency of nutrients, enough bulk for safety in digestion, and a high degree of palatability. A good mixture of concentrates and a variety of hays and fodders or grazing will readily meet the requirements of a balanced ration.

Punctuality in feeding.—All farm animals form strong habits for certain routine proceedings, and feeding time especially is anticipated with almost clock-work precision.

The observance of punctuality in feeding, regularity in work, and cleanliness in grooming not only promotes thriftiness and health in the horse, but ensures efficient and cheaper power.

Amounts and frequency of feeding.—Experienced observation is the best test as to a horse's satisfactory treatment and fit condition. Weight, appetite, condition of dung and spirit will give indications, if correctly interpreted.

In this connection, the following feeding rules may serve as a guide:—

(1) Idle or lightly worked horses should be fed bulkier feeds; a variety of good hays or good grazing will be sufficient to maintain a thrifty condition.

(2) With regular light work a small amount of concentrates—about $\frac{1}{2}$ lb. per 100 lb. live weight—will meet requirements.

THE HORSE ON THE FARM.

(3) Hard-worked horses will take up to 1 lb. concentrates per 100 lb. live weight and about as much of good leguminous hay—amounts that should be adjusted immediately the type of work becomes easier or the horses are idle.

Concentrate feeds are generally divided into three equal portions by weight for the day. Half of the hay ration is fed at the two meals



FIG. 2.—Brood mares bringing in a supply of hay feed.

during the day and the other half at night when the horse has more time to consume the bulkier hay. Often no hay or a light amount is fed at midday, since the horse works more comfortably if not unduly distended with hay.

Watering horses.—Horses should be fed and watered so regularly that they are never over-hungry or thirsty. Water them moderately before feeding and after work, and again moderately after feeding or before work; but do not permit a horse to drink his fill when very hot after hard work or before he is put to hard work. Mature horses will take from 10 to 12 gallons of water per day.

Concentrates.

Oats are the safest and best main grain feed for horses, especially stud stallions, brood mares and young stock. They contain more protein, mineral matter and fibre than maize, but are somewhat lower in energy value. Oats are probably the only grain that can be fed as the sole concentrate when no leguminous hay is available and only second-rate hays are used.

In hot weather oats are the only safe concentrate to feed if the work is hard and continuous.

Oats are preferably fed crushed or rolled to horses, and can be fed either as the sole concentrate, or mixed half and half with crushed maize, or even in a smaller percentage if a good legume hay is also fed as roughage.

Other small grains like wheat, rye and barley are also occasionally fed to horses in crushed form, but always in limited amounts and mixed with other feeds to prevent digestive disturbances.

Maize.—Only good quality maize should be used as a horse feed, since any unsound maize readily causes digestive troubles. As it is lacking in the essential amounts of protein and mineral matter, it cannot form—as is often unfortunately the case in the Union—the sole concentrate when no leguminous hay is also fed. It has, however, the highest energy value of grain feeds, and in combination with a protein-rich grain or by-product, concentrates and leguminous hays, it is in many areas the staple grain feed.



FIG. 3.—Brood mares bringing in farm feed (Cedara).

Other Feeds.

Various cereal by-products are good horse feeds.

Bran, for example, contains very desirable proteins and mineral matter, and on account of its bulk not only mixes well with other feeds, but also promotes health. Bran may form a regular portion of the ration when cost permits, or it may be given as a mash once or twice weekly, instead of the evening meal. Ten to fifteen per cent. of bran may be used with oats and maize when no legume hay is available.

A good bran mash is made of 3 to 5 lb. of dry bran, a tablespoonful of salt, and enough water to make it crumbly.

Linseed meal is, as in the case of other stock, a very good conditioner and laxative. It is a high protein feed, having about four times the value of bran and can be used when that feed is not available. About 1 lb. per day mixed with the usual concentrate ration will be sufficient, especially if the concentrates are not of high quality or sufficient variety. It promotes healthy skins and glossy coats, and is therefore necessary for conditioning horses for show purposes.

The regular use of small amounts of linseed meal ensures greater thriftiness and saves outlay on condition powders and other medicines.

Hays.—Lucerne hay is considered as most suitable for horses on account of its net energy value, total digestible nutrients, amount of crude protein and its larger yield of nutrients per morgen. For idle

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horses it can be mixed half and half with other hays such as sweet-grass hay and teff. Great care must be taken, however, that such hays are wholesome in all respects. Feed only well-matured, properly cured lucerne hay, and preferably the first cutting. Freshly cured lucerne hay may often cause prussic acid poisoning. As the only roughage, it should not be fed in larger quantities than 1 lb. per 100 lb. live weight.



FIG. 4.—A load of winter feed on the way to the farm.

Best results are obtained when lucerne hay forms one third to one half of the daily hay ration and when the rest is made up of sweet-grass or other hay such as oat hay or teff.

Sheaf oats are a very common horse feed all over the Union. The ordinary early varieties of oats yield about equal amounts of straw and grain and, therefore, for short periods form a very satisfactory and adequate feed.

Bright, well-cured sheaf oats are very palatable if properly cut and cured. Cut too green or mixed with weeds, oats often produce a musty, unpalatable and unsafe feed. Fed along with a good legume hay or good pasture, sheaf oats provide a good feed for idle horses, brood mares and young stock.

Good sheaf oats form a cheap feed since threshing is saved, and are often more economical to feed if properly chaffed.

Pastures.—Good grazing is not only very healthy, but saves on the feed bill since there is no stabling or stable work. A large variety of grasses and natural veld grazing suit horses. A change of diet and grazing over different pastures reduce parasitic infestation. Treatment for parasites, internal and external, is very important. Small paddocks or camps used all the year round become filthy and often infested with internal parasites; such pastures should be rested or grazed in rotation. Fresh pastures are often too washy for horses and they should only be grazed when a fair growth has been reached.

Silage furnishes a fair feed for *idle horses* if made from mature and sound preserved maize. Mouldy silage is dangerous and even good silage is a doubtful feed for *work horses* or *brood mares*.

Carrots contain vitamins A, B, C, and E which are excellent tonics for all classes of horses, especially when stabled, for they have a beneficial effect on the digestive system, besides being fairly rich in calcium.

They should be sliced and up to 4 lb. per day fed per horse, while even a pound a day will be desirable since succulence is most essential for good health.

Preparation of Feeds.

Horses with good teeth can manage unground grain and unchaffed hays, but ground or crushed grain and chaffed hay are more palatable and more readily consumed. The cost of grinding and chaffing offsets the wastage. Oats are invariably fed crushed or rolled.

Overwintering Idle and Breeding Stock.

Undue economy and a too frugal treatment of such stock often causes more damage than any other cause.

Idle work horses often lose too much weight and are unfit for work in early summer. Young stock are stunted and brood mares get into a too low condition to nurse their foals well. Such horses should be kept in a thrifty condition—not overfat, but with ribs well covered and in vigorous health. Work horses that received good treatment during the winter can be put into shape within two weeks for the summer's hard work, while brood mares will be in fit foaling condition and young stock will not have been stunted in growth and development.

There is hardly any area in South Africa where good draught horses do not suffer a setback when not provided with additional feed or spare veld or pastures during winter. Difficult as it may be in certain areas, additional provision must be made, even if it means maintaining a smaller number of good horses, rather than let a large troop all suffer for want of proper care.

Provision must be made for at least one feed of good hay per day. Any of the leguminous hays will do, e.g. lucerne, cowpea, soya bean, with free access to straw and other roughage such as veld-grass hay, stover, etc. This additional attention to young draught horse stock is most important, for size and weight, the prime essentials in the draught horse, cannot be secured when young stock are stunted during successive winters.

Shelter.

Inexpensive shelters can be provided for weanlings and other young stock. Large open barns or stack yards or even warm paddocks, well sheltered with trees, will contribute very largely to the thriftiness, comfort and continued development of young stock. Proper stabling, of course, will give best results, and the large horse-breeder should decide whether it is more profitable to raise a dozen or more good colts properly or take his chances with a wild and stunted mob on the veld. Such animals—the products of uneconomic, unbalanced and unwise horse husbandry—often form up to 90 per cent. of the miserable and often useless stock at our large horse sales.

A good horse is the product *inter alia* of a long-term efficiency job, and not merely a temporary economic effort, as is the case with fat steers or other slaughter stock.

THE HORSE ON THE FARM.

Working in Hot Weather.

Most of the hard work done by horses takes place during spring and summer, and it is of prime importance to keep the horses fit for spells of pressing work. Much depends on correct feeding. The bowels should be kept in a healthy condition. "Dry-dung" horses are likely to suffer from heat and digestive troubles. Succulent mash twice a week is very desirable, while a regular supply of salt, about 3 per cent. in the grain feed, is essential to offset profuse perspiration.

Frequent light watering, about every two hours or oftener, will not only relieve heat distress, but greatly refreshen the team and the labourers. A barrel of water and pail should be regular items in the field.

In extremely hot weather man and beast should be considered by resorting to the following expedients:—reducing work hours, lightening the work, lengthening the midday rest period, starting work earlier and stopping before noon. In many parts of the world and even in our large grain-growing areas farmers successfully work their horses or mules at night.

Horses that refuse their feed should not be sent to work but kept indoors or in a shaded paddock. In such cases and also in many others a reliable groom is indispensable in order to avoid overworking, and even losses, of valuable animals.

When a sick horse is put to work his sweat will "dry in" and he will pant and possibly wobble in his gait. The careful horseman will unhitch him and, if overheated, put him in a shady place and apply cold water or ice to his head, spine and legs. As a heart stimulant, camphorated oil is useful, but prevention is important, as such a horse, even though he recovers, will be more subject to over-heating when worked hard.

New Bulletins.

The following Bulletins have recently been published:—

Bulletin No. 249, Winter Pruning and Trellising of Vines,
Price 3d.

Bulletin No. 259, The Engineering Problems in Soil Erosion
Control, Price 6d.

Suicidal Farming versus Strip Cropping (Free).

Bulletin No. 264, Turkeys, Price 3d.

Obtainable from the Editor of Publications, Department of
Agriculture, Pretoria.

*Amounts of more than sixpence must be sent in the form of
postal orders, cheques, etc.*

Value of Dry-land Lucerne Pastures in Western Cape Province.

A. Skibbe, Stellenbosch-Elsenburg College of Agriculture.

TO prevent the depletion of soil fertility by the continuous cultivation of cereals farmers are advised to follow a crop rotation which will include a legume. Now, lucerne is undoubtedly an ideal leguminous plant, which has proved itself to be suitable for grazing under Western Province conditions, and consequently farmers are encouraged to put part of their lands under lucerne, not only because it is valuable for soil conservation, but also because it provides valuable grazing, if the rains are adequate, from autumn to early summer under dry-land conditions.

During 1934-1939 dairy cows and in 1940 ewes and their lambs were allowed to graze on a mixed lucerne pasture in an experimental test at Mariendahl, and from the data of the milk yields and of fat-lambs, suitable for slaughter, the gross returns per morgen were estimated for each season. The cost of grazing the animals was calculated from the initial and annual expenses incurred in the maintenance of the pasture. An allowance was also made for the wages of labour and for interest on the capital invested in cows. By deducting the latter expenses from the gross returns the direct approximate net profit per morgen is obtained, as no allowance is made for expenses on management or depreciation of the herd, buildings and equipment.

Description of Experimental Pasture Camps.

During the spring of 1933 lucerne was established on one of the camps at Mariendahl and was subsequently utilized for the purpose of a grazing experiment. The total area of the camp was four morgen, which in 1935 was divided into eight similar rectangular plots.

The principal flora were lucerne (*Medicago sativa*), gousblom (*Cryptostemma calandulaceum*) and turksnaels or muskus (*Erodium moschatum*). On 6 September 1934 the pasture consisted mainly of gousblom (85 per cent.), but by 1940 this weed had practically disappeared. Turksnaels, although only present in traces at the commencement, completely replaced gousblom by the end of the experimental period. The pasture in autumn, with early rains under warmer conditions, consists largely of lucerne, but by the beginning of spring about half the herbage, more or less, is composed of lucerne and weeds, in which either gousblom or turksnaels may be predominant, and as the season advances the lucerne again becomes more and more conspicuous until towards the close the weeds have wholly disappeared. These observations naturally apply to a pasture which is rotationally grazed during the season.

Milk Production and Cow-days per Morgen.

During the period under review an average of 6,000 lb. of milk was produced annually on a morgen of land under lucerne pasture. Table 1 gives particulars of each year's yields, cow-days, etc., per morgen.

By the term cow-days is meant the product of the number of cows and the number of grazing days. Thus in 1934 four cows grazed on a plot for 51 days, which therefore gives 204 cow-days. From the data it can be seen that a fairly high average, namely, 188

VALUE OF DRY-LAND LUCERNE.

Table 1.—Milk yields and cow-days per morgen.

Year.	Total milk production (lb.).	No. of cow-days.	Average milk production per cow-day in lb.	Potential number of cow-days.
1934.....	9,049	204	44.36	—
1935.....	7,080	204	34.71	80
1936.....	3,928	122	32.20	42
1937.....	6,298	262	24.04	—
1938.....	4,888	212	23.06	28
1939.....	4,854	124	39.15	—
TOTAL.....	36,097	1,128	—	150
MEAN.....	6,016	188	32.0	25

cow-days, was obtained, although during the years 1936 and 1939 it fell considerably. Milk was produced for each of these cow-days.

Occasionally, when suitable *milk cows* were not available, other livestock such as dry cows, etc., were put directly on the pasture when it was suitable for grazing, and from the number of animal-days the potential number of cow-days was estimated; thus in the year 1935 the cow-days was estimated from 26 head of cattle which had grazed for 4 days on one morgen of land.

From the data presented in Table 1 it will be observed that there is a distinct scatter in the yearly milk yields. These differences may be due to (a) poorer seasons which are reflected by a diminished number of cow-days per year, (b) lower milk producers, and (c) an injudicious system of grazing.

Production Costs of Lucerne Grazing.

What it costs to graze a cow will naturally depend upon the expenditure incurred in establishing and maintaining a mixed lucerne pasture. In this experiment the ground was prepared only once, i.e. at the end of 1933, before the six-year grazing period by cows, so that the average annual expenditure has to be estimated.

Cost per Morgen of Establishing and Maintaining a Lucerne Pasture.

	£ s. d.
(a) Cost of preparation of land (£4) spread over 6 years	0 13 4
(b) Cost of fertilizers applied twice per annum:—	
300 lb. superphosphate at £6-15s. per ton	20.25/-
50 lb. muriate of potash at £21 per ton	10.50/-
30 lb. nitrate of soda at £16 per ton	4.80/-
Cost of application ... ..	.50/-
	36.05/-
∴ 2 × 36.05/- = 72.1/-	3 12 0
(c) Interest on land:—	
At 5 per cent per annum on £20 per morgen	1 0 0
(d) Chain harrowing three times at 4d. per morgen	0 1 0
Total annual expenditure	£5 6 4

From Table 1 it will be observed that the possible average number of cow-days per season is 213 (i.e. $188 + 25$). If, therefore, the above annual expenditure is divided by 213 and multiplied by 30, it will be possible to determine the grazing costs for 30 cow-days or a cow-month.

For example, the annual expenditure £5 6s. 4d. divided by 213 and multiplied by 30 = 14.63/-, i.e. grazing costs per cow per month = 15/- (approximately).

The cows in the experiment were Frieslands averaging 1,200 lb. in weight, and yielding on an average 3 gallons of milk per day.

It is generally known that cows need varying amounts of total digestible nutrients, the quantity depending on the weight of the animal and its production of milk. Now, the requirements of total digestible nutrients (T.D.N.) for a cow of approximately 1,200 lb. weight are as follows:—

For maintenance 9.00 lb.

Per gallon of milk 3.00 lb.

Thus, for a cow yielding on an average 3 gallons of milk daily, the amount of T.D.N. necessary per day is 9.00 lb. for maintenance, plus 3×3.00 lb. for milk, i.e. a total of 18 lb. If the grazing costs of a 1,200-lb. cow producing 3 gallons of milk are 15/- per month, then one would expect the grazing costs of a 1,200-lb. dry cow to be only $\frac{9}{18}$, or $\frac{1}{2}$ of 15s., i.e. 7s. 6d. per month.

In the following table the writer has attempted to draw up the grazing costs per month for 1,200-lb. cows with varying milk yields.

TABLE 2.—*Grazing costs for cows with varying milk yields.*

Average daily production.	T.D.N. daily requirement.	Grazing costs.	
		Per 30 days.	Per day.
Gallons.	lb.	s. d.	s. d.
0	9	7 6	0 3
1	12	10 0	0 4
2	15	12 6	0 5
3	18	15 0	0 6
4	21	17 6	0 7
5	24	20 0	0 8

As the cows in the experiment under discussion were left on the plots, no expenses were incurred for stabling. The estimated cost for labour for milking, watering and transferring to new paddocks was 5s. for a cow per month. With cows not on pasture the wages bill would undoubtedly be higher. If the cows are valued at £50 each, then the interest charges at 5 per cent. per annum will be equal to 4s. 2d. per month.

In Table 3 the annual profits to the nearest shilling have been calculated by making use of the data on the cost of grazing and labour and interest on capital invested in cows, the price of milk being assumed to be either 1s. or 2s. per gallon.

In this calculation of the profits no account was taken of the depreciation of cows and certain miscellaneous items of expenditure such as, for example, the erection of wire fences for suitable paddocks.

VALUE OF DRY-LAND LUCERNE.

TABLE 3.—*Profit on milk to nearest shilling (per morgen).*

Year.....	1934	1935	1936	1937	1938	1939	Mean
At 1s. per gallon.....	£ s. 35 17	£ s. 26 15	£ s. 14 13	£ s. 21 12	£ s. 16 10	£ s. 19 10	£ s. 22 9
At 2s. per gallon.....	81 2	62 3	34 5	53 2	40 19	43 15	52 11

Obviously the statement of the profits must be taken with a certain amount of reserve, because, although a considerable economy is effected by having the cows on pasture from 4-6 months, yet when the grazing season is over, other arrangements have to be made for feeding of the animals, which will substantially reduce the amount of the gains. The carrying capacity is related to the amount of pasture available, which undoubtedly varies from year to year according to the nature of the season. Incidentally, even during different periods of the season the carrying capacity will not remain uniform, but will be more highly concentrated during the spring months of active growth.

No allowance has been made for the restorative effect of lucerne on the soil, which was not only physically improved but also chemically enriched by the manure of the animals and the addition of fertilizers, so that subsequent crops, either cereal or other, should benefit considerably.

From unpublished data kindly supplied by the Department of Agronomy of the Stellenbosch-Elsenburg College of Agriculture, wheat following a four-year stand of lucerne gave yields more than twice as great as wheat in the wheat-fallow system. The lucerne also has a strong residual effect and enhances the yields of subsequent grain crops in the rotation.

Inclusion of Supplementary Feeds.—When supplementary feeds in the form of pressed oats and chaff are included, the financial returns per morgen can be increased by allowing more and higher milk producers to graze.

In one of the tests, two cows produced 5,890 lb. milk on one and a half morgen of pasture alone during a period of 76 days (i.e. 152 cow-days), so that the average daily production per cow was 3·875 gallons. On another one and a half morgen of pasture and supplementary feed two cows for the full period of 76 days and an extra cow, introduced at a later stage, for a period of 58 days yielded 9,007 lb. milk for the 210 cow-days, so that the average daily production here was 4·289 gallons per cow-day. In comparison with a cow on pasture only, it was calculated that the daily grazing consumption of a cow supplied with supplementary feeds as well was on an average only 0·69 the amount of that consumed by the former.

During the 210 cow-days the cows consumed, in addition, the following rations, viz. 1,353 lb. of pressed oats and 896 lb. of chaff, which represent an average consumption of 6·443 lb. of oats and 4·267 lb. of chaff per cow-day. If a bag of oats is valued at 17s. and chaff at 2s. per bale (80 lb.), then the cost of the supplementary feeds will be 0·837s. per day for an average daily milk production of 4·289 gallons on pasture and supplementary feeds. For a production of 4 gallons of milk per day the cost should be proportionally reduced to 0·8034s. per day, which is equal to 24s. per month.

It is then possible, by making use of the T.D.N. consumed on a proportionate basis by cows with a higher or lower production, to estimate the cost of the supplementary feeds, as shown in Table 4.

TABLE 4.—*Cost of supplementary rations.*

Average daily production of milk.	T.D.N. daily requirement.	Cost of supplementary feeds per cow-month.
Gallons.	lb.	s. d.
0	9	10 3
1	12	13 8
2	15	17 2
3	18	20 7
4	21	24 0
5	24	27 5

If, instead of being allowed to graze, the cow is fed lucerne hay and a meal mixture, the cost will be greatly increased.

The following ration of 25 lb. lucerne hay and 12 lb. of meal mixture can be considered as suitable for a 1,200-lb. cow producing 4 gallons of milk (butterfat 3½ per cent.) per day. This ration would supply 22 lb. of total digestible nutrients per day if mealimeal were used instead of the meal mixture.

The cost of the ration is as follows: —

	s. d.
25 lb. of lucerne hay at 6s. per 100 lb.	1 6
12 lb. of mealimeal at 21s. per 200 lb.	1 3
i.e. Cost per day	2 9
i.e. Cost per month (30 days)	82 6

Similarly, by calculating as for grazing and supplementary feeds it is possible to estimate the feeding costs of other cows with a higher or lower production.

TABLE 5.—*Cost of rations, when used as only sources of feed.*

Average daily production of milk.	T.D.N. daily requirement.	Cost of rations per cow-month.
Gallons.	lb.	s. d.
0	9	35 5
1	12	47 2
2	15	58 11
3	18	70 9
4	21	82 6
5	24	94 4

From the cost of grazing alone, of grazing together with supplementary feeds, and of rations only, it is possible to draw up a table (see Table 6) of the possible profits or losses. In this table the labour cost per cow per month will be taken as 5s. per month, although in the case of a cow receiving a weighed amount of rations per day the expenses will be higher as more attention is required. The interest on the cows, valued at £50 each, is 4s. 2d. per month, so that the outlay will be 9s. 2d. per month.

VALUE OF DRY-LAND LUCERNE.

Comparison of Profits and Losses under Different Systems of Feeding.

From Table 6 (page 398) it can be seen that:—

(1) Profits are highest when only grazing is practised. Incidentally if any losses are sustained, as with dry cows, they are reduced to a minimum under grazing. A further reduction could be effected by allowing dry cows to graze on the residues left by the milk producers, because this part of the pasture is less valuable than the pasture before grazing.

(2) Profits on individual cows are reduced where supplementary feeds are supplied in addition to the ordinary grazing. By the inclusion of supplementary feeds it is possible, however, to increase the carrying capacity of the pasture. In the case of cows with a production of 4 gallons of milk per day it was found that three cows, instead of two, were able to graze on the pasture. If the column (3f-2g) of block (b) is examined, i.e. where the differences in cash returns from three cows and two cows producing 4 gallons of milk per cow-day under different systems of feeding are estimated, it will be found that the income from the same area of land can be increased by £1. 17s. 7d. per month by the inclusion of an additional cow when milk is sold at 1s. per gallon, and by £7. 17s. 5d. when milk is valued at 2s. per gallon.

(3) When rations only are used, losses are sustained until the stage is reached where a production of 3 gallons per day is obtained. This applies only when milk is valued at 1s. per gallon, because at 2s. per gallon the sale becomes profitable at a stage between one and two gallons. With rations only, the losses sustained on the non-producers is £1. 15s. 5d. per month if labour and interest charges are disregarded. It appears that the average production of the herd must be at least 3 gallons to prevent a loss being incurred when milk is sold at 1s. per gallon.

(4) The profits are more than doubled if the price which the dairyman receives, is doubled. This can be checked by comparing the returns of the cows under the columns for 1s. and the 2s. per gallon, respectively. For example, for pasture only (see I), when the 4-gallon column is examined, it is found that the profits with milk at 1s. per gallon are £4 13s. 4d., and at 2s. per gallon are £10 13s. 4d. With supplementary feeds and grazing (see II), the profits are £3. 14s. 9d. and £9. 14s. 9d. with milk at 1s. and 2s. per gallon respectively. On rations only, the profits are £1. 8s. 4d. and £7. 8s. 4d. with milk at 1s. and 2s. per gallon, respectively.

(5) Lower producers are more of a liability than an asset and, consequently, it should be the aim of dairymen to eliminate these and to introduce better producers into the herd for increasing profits.

(6) On lucerne pastures it was possible during a period of six years to produce milk at an average of 3 gallons per cow per day. The writer is convinced that this figure can be improved upon by the use of a good class of animal and by a judicious system of grazing. Although an average of 4·3 gallons was obtained on lucerne pasture, chaff and pressed oats, it should be possible with mature cows to average 5 gallons. With a less fibrous type of supplementary feed during periods when the grazing itself is inclined to be fibrous, even 5 gallons should be exceeded. What production is possible with more concentrated and less fibrous supplementary feeds, it is difficult to predict.

Cost of Grazing and Cash Returns from Sheep on Mixed Lucerne Pastures.

During the 1940 season grazing was continued on the mixed lucerne pasture, but ewes and lambs were substituted for the milk-producing cows. On plots 7 and 8 of the original series, oats were sown for grazing. The crops throughout were more or less admixed with turksnaels, the quantity of which depended upon the time of the season. On plots 7 and 8 the predominant crop was oats, and on the other six lucerne.

Two groups, each consisting of 24 ewes and 29 lambs, respectively, were used at the commencement of the test and were allowed to graze on plots which were considered to have attained a sufficient growth of pasture. The average carrying capacity during the season on three morgen of mixed lucerne pasture was found to be 4,654½ ewe-days and 3,973 lamb-days (for a period of 196½ days). If, for purposes of comparison, the above figures are reduced to a common basis, it will be easy to estimate the cost of grazing. Let one ewe-day be equivalent to two lamb-days. Then the composite number of lamb-days would be 13,282 for three morgen, and consequently one-third of this figure, i.e. 4,427, per morgen.

On plots 7 and 8 the carrying capacity per morgen was very much less. Here the number of ewe-days amounted to 977 and the lamb-days to 1,120 per morgen, when the composite number of lamb-days is 3,074 in comparison with 4,427 on the lucerne plots.

Cost of Grazing on Lucerne Pastures.

To determine the cost of grazing, the annual expenditure of £5. 6s. 4d., as estimated for the establishment and maintenance of the lucerne pasture, can be divided by the number of lamb-days, i.e. 4,427, and multiplied by 30, and in this manner it will be found that the monthly grazing expenses for a lamb will amount to 8½d., or 1s. 5d. for a ewe.

For easier calculation it is more convenient to increase the costs slightly per month, i.e. to 9d. per lamb and 1s. 6d. per ewe.

Cost of Production per Morgen of an Oat Crop for Grazing.

(a) Preparation of land.	£	s.	d.
(This includes ploughing, labour, harrowing, seeds and sowing.)	...	...	...
(b) Fertilizer:—			
400 lb. of mixture E at £10 per ton	2	0	0
(c) Interest on land:—			
5 per cent. on £20 per morgen	1	0	0
Total cost per morgen	£4	15	0

Grazing Costs on Oat Pasture.

Now since the composite number of lamb-days on oats is 3,074, the cost to feed a lamb per month

$$\begin{aligned} & \frac{£4. 15s. \times 30}{3,074} \\ & = 11.125d. \end{aligned}$$

∴ Cost to feed a ewe per month = $2 \times 11.125d. = 1s. 10\frac{1}{2}d.$

In comparison with the mixed lucerne grazing, it can be seen that the grazing on oat pasture is 1s. 10½d. - 1s. 5d., i.e. 5½d. more expensive per ewe per month.

Returns from Wool from Ewes.

From the number of days that the ewes grazed on the pasture it was possible by proportion to estimate the value of the wool produced during the period of the experiment. The value of the wool is estimated at 10s. per German merino grade ewe. From this valuation the value of the wool produced on lucerne pasture was £2. 3s. 4d., and on the oat pasture only £1. 6s. 7d. per morgen.

Deductions have also to be made for the grazing costs of both the ewes and the lambs on the two different types of pasture. Interest charges on the capital invested in the ewes, valued at £3 each, at 5 per cent. per annum for the period on pasture, must also be included. Incidentally, a ewe died during the course of the experiment, for which loss an allowance has also been made.

Details of the receipts and expenses are shown in the following "Profit and Loss Account", which are estimated on a per morgen basis.

Profit and Loss Account for Ewes and Lambs.

On Mixed Lucerne Pasture per Morgen.

Credit.

	£	s.	d.
(1) By sale of lambs	18	17	0
(2) By sale of wool from ewes	2	3	4
	<u>£21</u>	<u>0</u>	<u>4</u>

Debit.

	£	s.	d.
(1) To cost of grazing (lambs)	1	13	1
(2) To cost of grazing (ewes)	3	17	7
(3) To interest charges on ewes		13	0
(4) To loss of ewe		16	6
	<u>£ 7</u>	<u>0</u>	<u>2</u>

Profit = £21. 0s. 4d. - £7. 0s. 2d. £14 0 2

On Oat Pasture per Morgen.

Credit.

	£	s.	d.
(1) By sale of lambs	15	19	0
(2) By sale of wool	1	6	7
	<u>£17</u>	<u>5</u>	<u>7</u>

Debit.

	£	s.	d.
(1) To cost of grazing (lambs)	1	14	7
(2) To cost of grazing (ewes)	3	0	5
(3) To interest charges on ewes		8	0
(4) To loss of ewe		10	5
	<u>£ 5</u>	<u>13</u>	<u>5</u>

Profit = £17. 5s. 7d. - £5. 13s. 5d. £11 12 2

TABLE VI.—*Estimated monthly profit or loss per morgen :—(a) under different systems of feeding ;
(b) due to increased carrying capacity with use of supplementary feeds.*

MILK AT 1S. PER GALLON.							
Average production of milk per cow-day in gallons.							
	0.	1.	2.	3.	4.	5.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
By sale of milk per 30 days.....	—	1 10 0	3 0 0	4 10 0	6 0 0	7 10 0	
I. To cost of grazing (A).....	0 7 6	0 10 0	0 12 6	0 15 0	0 17 6	1 0 0	
Profit or loss per month.....	—(0 7 6)	1 0 0	2 7 6	3 15 0	5 2 6	6 10 0	
Less 9s. 2d. for labour and interest (g).....	—(0 16 8)	0 10 10	1 18 4	3 5 10	4 13 4	6 0 10	
II. To cost of supplementary feeds.....	0 10 3	0 13 8	0 17 2	1 0 7	1 4 0	1 7 5	
To cost of grazing (= 0·69A).....	0 5 2	0 6 11	0 8 8	0 10 4	0 12 1	0 13 10	
Total cost of feeds.....	0 15 5	1 0 7	1 5 10	1 10 11	1 16 1	2 1 3	
Profit or loss per month.....	—(0 15 5)	0 9 5	1 14 2	2 19 1	4 3 11	5 8 9	
Less 9s. 2d. for labour and interest (f).....	—(1 4 7)	0 0 3	1 5 0	2 9 9	3 14 9	4 19 7	
III. To cost of rations.....	1 15 5	2 7 2	2 18 11	3 10 9	4 12 6	4 14 4	
Profit or loss per month.....	—(1 15 5)	—(0 17 2)	0 1 1	0 19 3	1 17 6	2 15 8	
Less 9s. 2d. for labour and interest.....	—(2 4 7)	—(1 6 4)	—(0 8 1)	0 10 1	1 8 4	2 6 6	
Comparison of two cows on grazing (I) only, against three cows on grazing and supplementary feeds (II)—							
Profit or loss from three cows (3 × f).....	—(3 13 9)	0 0 9	3 15 0	7 9 3	11 4 3	14 18 9	
Profit or loss from two cows (2 × g).....	—(1 13 4)	1 1 8	3 16 8	6 11 8	9 6 8	12 1 8	
Difference (3f — 2g).....	—	—(1 0 11)	—(0 1 8)	0 17 7	1 17 7	2 17 1	

(a)

(b)

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MILK AT 2s. PER GALLON.											
Average production of milk per cow-day in gallons.											
0.		1.		2.		3.		4.		5.	
£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	
3 0 0		3 0 0		6 0 0		9 0 0		12 0 0		15 0 0	
0 7 6		0 10 0		0 12 6		0 15 0		0 17 6		1 0 0	
— (0 7 6)		2 10 0		5 7 6		8 5 0		11 2 6		14 0 0	
— (0 16 8)		2 0 10		4 18 4		7 15 10		10 13 4		13 10 10	
0 10 3		0 13 8		0 17 2		1 0 7		1 4 0		1 7 5	
0 5 2		0 6 11		0 8 8		0 10 4		0 12 1		0 13 10	
0 15 5		1 0 7		1 5 10		1 10 11		1 16 1		2 1 3	
— (0 15 5)		1 19 5		4 14 2		7 9 1		10 3 11		12 18 9	
— (1 4 7)		1 10 3		4 5 0		6 19 11		9 14 9		12 9 7	
1 15 5		2 7 2		2 18 11		3 10 9		4 2 6		4 14 4	
— (1 15 5)		0 12 10		3 1 1		5 9 3		7 17 6		10 5 8	
— (2 4 7)		0 3 8		2 11 11		5 0 1		7 8 4		9 16 6	
Comparison of two cows on grazing (I) only, against three cows on grazing and supplementary feeds (II)—											
Profit or loss from three cows (3 × f).....										29 4 3	
Profit or loss from two cows (2 × g).....										21 6 8	
Difference (3f — 2g).....										7 17 5	

(a)	By sale of milk per 30 days.....										
	I. To cost of grazing (A).....										
	Profit or loss per month.....										
	Less 9s. 2d. for labour and interest (g).....										
(b)	II. To cost of supplementary feeds.....										
	To cost of grazing (= 0·69A).....										
	Total cost of feeds.....										
	Profit or loss per month.....										
(c)	Less 9s. 2d. for labour and interest (f).....										
	III. To cost of rations.....										
	Profit or loss per month.....										
	Less 9s. 2d. for labour and interest.....										

I. Cost of grazing from Table 2. II. Cost of supplementary feeds from Table 4. III. Cost of rations from Table 5.

From these results it appears that approximately one-third must be deducted from the gross income in order to obtain the net income from a morgen of pasture, irrespective of whether the latter is mixed lucerne or oats. The profit from the lucerne pasture was £2. 8s. per morgen more than that obtained from the oat crop, notwithstanding the six-year grazing period of the cows. On both types of grazing a loss is incurred on the ewes, because the grazing costs exceeded the value of the wool, which is assumed to be growing at a proportionate rate throughout the year.

From the data presented it thus appears that the returns from dairy cows on lucerne pasture are very attractive; they are distinctly higher than those from fat-lambs. It would probably be more advisable to adjust the grazing periods of both classes of animals, namely, by curtailing the grazing period of good milk-cows on the mixed pasture and thus maintaining a higher daily average production of milk per cow, and then by allowing ewes and fat-lambs to follow on the residual grazing.

Summary and Conclusions.

(1) The average annual seasonal production for a six-year period was 6,000 lb. of milk per morgen.

(2) For this period, the profits per morgen, on mixed lucerne pasture, obtained after deduction of the wages of labour and interest charges on the capital invested in cows, averaged £22. 9s. and £52. 11s. annually at 1s. and 2s. per gallon of milk, respectively.

(3) Profits are considerably reduced by feeding rations only, while the economical nature of pasture is clearly perceptible. Profits depend mainly on the system of feeding practised.

(4) Low milk producers should be weeded out as they reduce the profits made on the higher producers. This is easily comprehensible because most of the food is used for the animal's maintenance instead of producing milk.

(5) The average daily production per Friesland cow was slightly more than 3 gallons on pasture.

(6) On lucerne the gross returns of £21. 0s. 4d. from fat-lambs were reduced to £14. 0s. 2d. per morgen and on oats from £17. 5s. 7d. to £11. 12s. 2d. per morgen. The expenses incurred in fat-lamb raising were thus roughly one-third of the gross returns.

(7) Farming with both dairy cows and fat-lambs will probably increase the profits. When the grazing period of good milk cows on pasture is curtailed, the daily milk production should remain fairly constant, or fall only a little, as the animals will then graze only the most nutritious part of the plants. Either ewes and their lambs or poor producers can follow up on the residual pasture.

Acknowledgments.—The writer wishes to express his indebtedness to Drs. Slabber, Swart and van Wyk for useful suggestions and for scrutinizing this article; to Mr. C. J. Starke for his advice on the valuation of the costs of preparing land for lucerne and oat grazing; and to Mr. W. F. Fouche for data on grazing and milk yields.

REFERENCE.

Morrison: Feeds and Feeding.

Agricultural Engineering.

III (a). Specifications for Circular Brick Reservoirs with Nine-Inch Wall and Exterior Spiral Reinforcement.

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THESE specifications have been prepared in response to numerous requests for particulars of reservoirs with nine-inch brick walls. Unnecessary details have been avoided with a view to brevity as most people dislike lengthy specifications.

Foundation.

A piece of piping 10 or 12 feet in length and $1\frac{1}{2}$ inches in diameter, is fixed in concrete at the point where the centre of the reservoir has to be. See that the pipe stands in a truly vertical position.



FIG. 1A.—The excavated foundation ring.



FIG. 1B.—Two brick courses on completed concrete foundation ring. (See also Fig 5.)

Mark out and excavate the trench for the foundation ring 16 inches wide and 12 inches deep (Fig. 1A), and, if the underlayer is shale, or good firm soil that will not contract and crack, the trench can be filled in with concrete consisting of 1 cement to $2\frac{1}{2}$ sand to 5 stone without any reinforcement.

If, however, black turf or red clay is encountered, the foundation ring should consist of 1 cement to 2 sand to 4 stone reinforced top and bottom with mild steel rods as indicated in Fig. 2. The top of the foundation should be smoothed off.

The method of placing the short length of outlet pipe in the foundation is indicated in Fig. 3. For stock-watering the outlet pipe should be $2\frac{1}{2}$ inches in diameter, while for irrigation a 4-inch pipe should be used.

First and Second Courses of Brickwork.

The concrete foundation ring should be completed in one day if possible, and the first course of bricks (a header course) should be laid not later than the next morning while the concrete is still green so that a perfect bond may be effected. The bricks are laid to a knot in a thin wire fastened to a slip-ring around the central pipe as indi-

cated in Fig. 4. The slip-ring may be held at the correct height by tying a piece of $\frac{1}{4}$ -inch rope around the pipe below the ring.

A $\frac{1}{4}$ -inch bolt 3 inches long should be embedded in the mortar at foundation level with the bolt head protruding about $\frac{1}{4}$ inch from the bricks so that the reinforcing wire can be conveniently fastened to it.

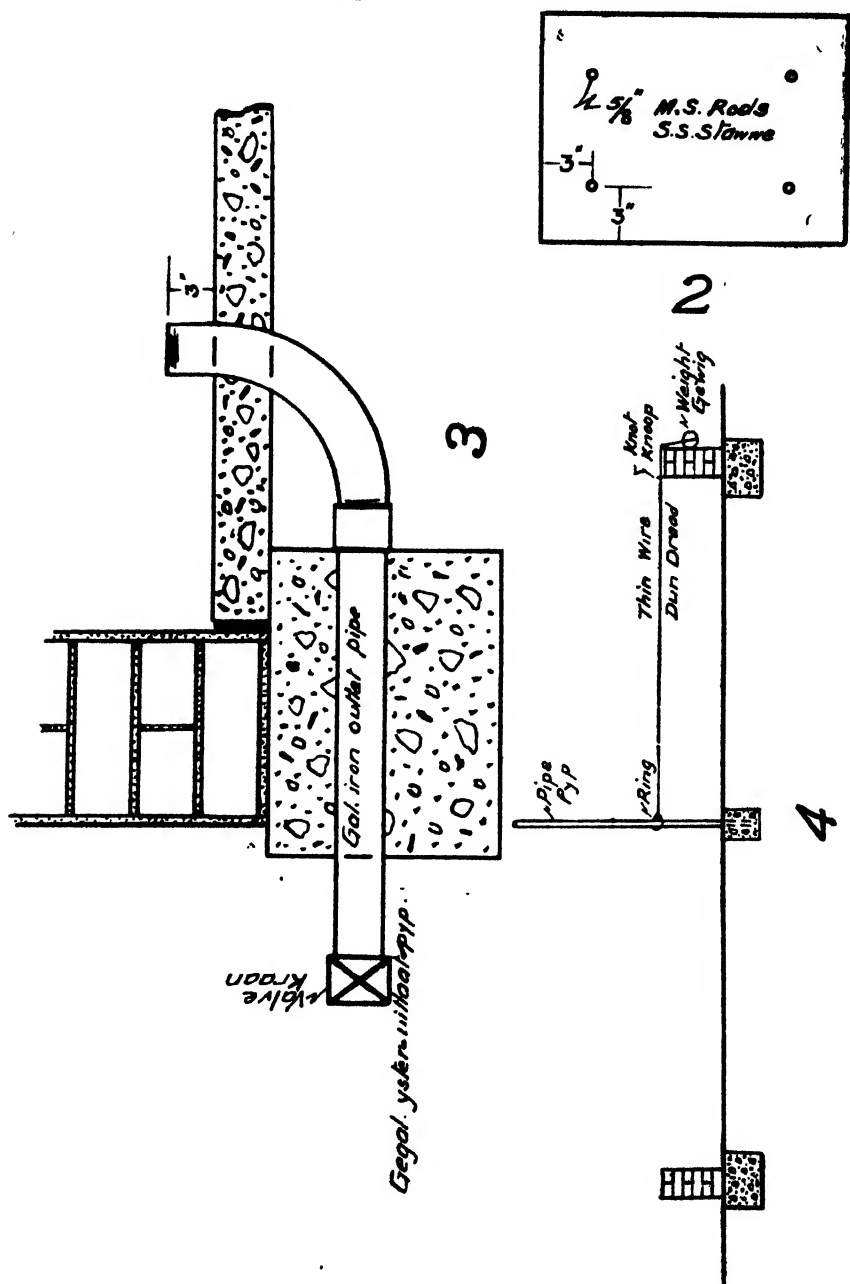


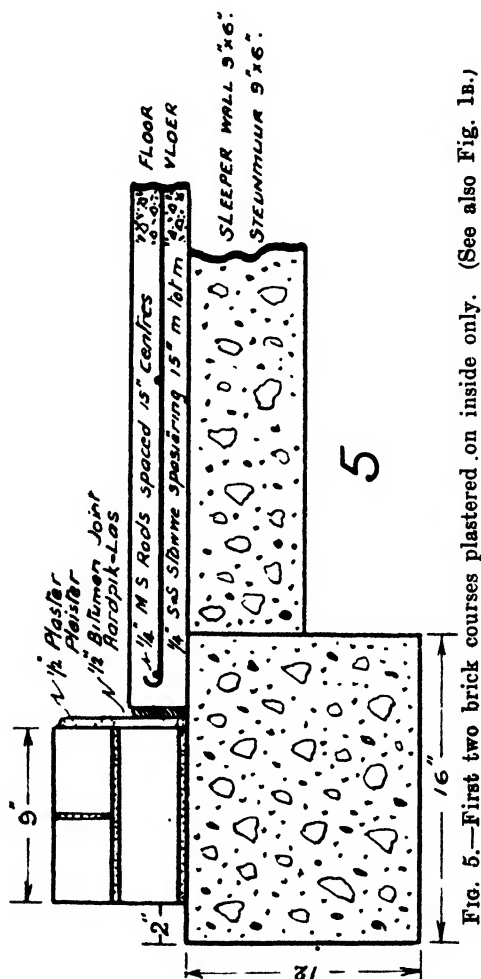
FIG. 2.—Foundation reinforced top and bottom with mild steel rods.

FIG. 3.—Short length of outlet pipe in position in foundation.

FIG. 4.—Bricks laid to a knot in a thin wire fastened to a slipring around the central pipe.

SPECIFICATIONS FOR CIRCULAR BRICK RESERVOIRS.

The second course of the brick wall (a stretcher course) (Fig. 1B), should now be laid and the two courses plastered a half inch thick on the inside only (Fig. 5). The mortar for laying the bricks in, as well as that for plastering, should consist of 1 cement to 3 sand. Care should be taken to see that the bricks are wet when being laid and plastered.



The foundation is then covered with old sacks to protect it from the sun; the rest of the brickwork is completed after the floor of the reservoir has been laid. The foundation should be kept wet.

Sleeper Walls.

The concrete sleeper walls (1 cement to 3 sand to 6 stone) upon which the floor rests (Fig. 6) are 9 inches wide and 6 inches thick, constructed along two diameters at right angles to each other so that the tops of the walls are level with the top of the foundation ring (Fig. 5). No reinforcement is required for these walls. The tops of the walls should be smoothed off.

Floor.

Before the floor of the reservoir is constructed the loose top soil should be removed and the spaces between the sleeper walls filled with

sand or well rammed gravel or small stone, level with the tops of the sleeper walls. The top of the inside portion of the foundation ring, as well as the tops of the sleeper walls, should be given a coat of bitumen so that the floor will be able to move freely when contracting. The floor is of concrete in the proportions 1 cement to 2 clean sand to 4 stone reinforced in two directions with $\frac{1}{4}$ -inch round mild steel rods as indicated in Fig. 5. The thickness of the floor should be 3 inches for reservoirs up to 40 feet in diameter, and 4 inches for larger reservoirs.

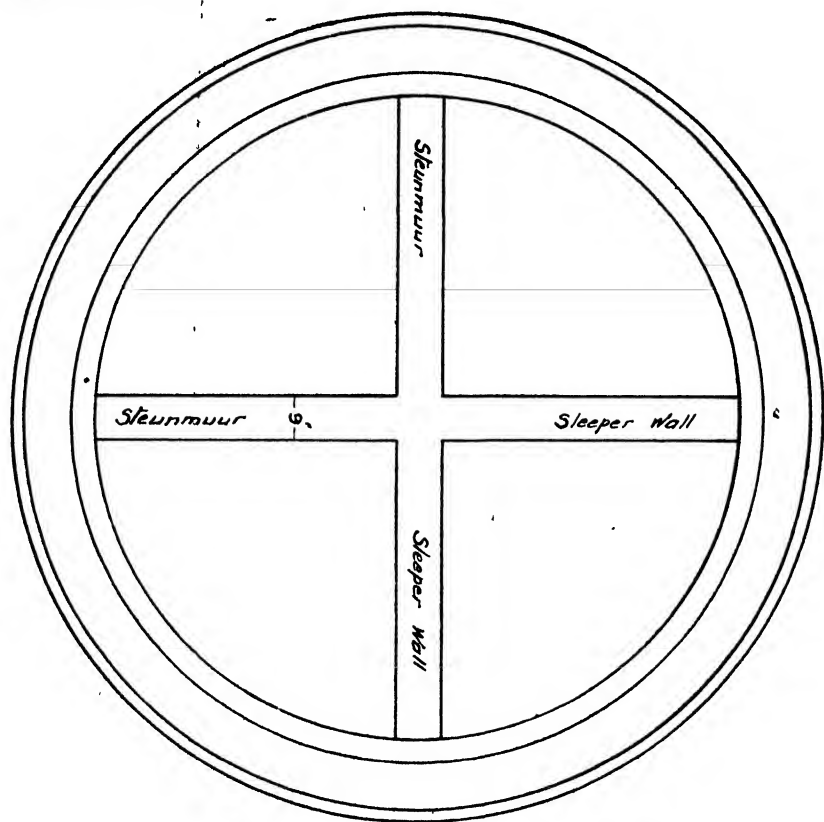


FIG. 6.—Concrete sleeper walls.

The floor is divided into four quadrants separated from one another and from the plastered wall of the reservoir by half-inch openings. The opening along the wall can be formed by folding old newspaper into strips and placing these against the wall. The paper and the strips of ceiling board forming the joints between the quadrants should be extracted while the concrete is still green.

The floor quadrants coincide with the sleeper walls so that the joints lie in the centre of the sleeper walls (Fig. 7). The floor should be covered with old sacks and kept wet for at least three weeks to allow the concrete to grow hard under favourable conditions.

Brick Wall.

As soon as the floor has been laid the brickwork can be continued with, the courses being header and stretcher alternately. At intervals of, say, 8 courses a $\frac{1}{4}$ -inch bolt should be embedded in a vertical joint

SPECIFICATIONS FOR CIRCULAR BRICK RESERVOIRS.

with its head protruding about $\frac{1}{2}$ inch, the last bolt being in the top course about 1 inch from the crest. Saw off the pipe at the centre of the reservoir as close to the floor as possible and fill in the hole with cement mortar.

Reinforcement.

The reinforcement consists of No. 12 gauge high strain steel wire. One end of the wire is then fastened to the bolt head at foundation level and the wire is then carefully wrapped tightly around the brick wall in spiral fashion, the appropriate number of turns of wire being spread over each foot height of the wall (see Fig. 8 and table below).

On reaching a bolt head, the wire is given a twist round the bolt and eventually fastened to the last bolt head in the uppermost course. To provide additional tension in the wire and at the same time ensure that the wires will be properly embedded in the plaster, old nails and short pieces of No. 8 gauge wire should be driven in here and there between the wire and the wall.

The following table gives the number of turns of wire recommended per foot height of wall for reservoirs six feet deep ranging from 15 to 80 feet in diameter.

Internal diameter of reservoir in feet.	Depth in feet.	Approximate capacity of reservoir in gallons.	Height of wall, in feet, from floor upwards.							Approx. number of bricks required.	Number of rolls of wire of 1,400 yds. required.
			0-1	1-2	2-3	3-4	4-5	5-6			
			Number of turns of wire per foot.								
15	6	6,600	5	5	5	5	5	5	3,000	2 $\frac{1}{4}$	
20	6	11,700	5	5	5	5	5	5	3,900	2 $\frac{1}{2}$	
30	6	26,400	8	7	5	5	5	5	5,800	4 $\frac{1}{4}$	
40	6	47,000	10	8	7	5	5	5	7,700	5 $\frac{1}{2}$	
50	6	73,500	12	11	7	6	5	5	9,600	6 $\frac{1}{2}$	
60	6	105,900	15	12	10	8	6	6	11,500	8 $\frac{1}{4}$	
70	6	144,100	18	15	12	10	6	6	13,400	10 $\frac{1}{4}$	
80	6	188,200	21	18	14	12	8	8	15,300	11 $\frac{1}{4}$	

Plaster.

The wall is plastered half an inch thick inside and outside with cement mortar in the proportion 1 cement to 3 sand, the bricks being kept wet while the plaster is applied. After the plaster has set, the top of the wall should be covered with old sacks and the plaster kept wet for six days before water is let into the reservoir.

Floor Joints.

The floor should be allowed to become bone dry before the openings between the quadrants and along the wall are filled in with bitumen, since bitumen does not adhere to a moist surface.

The joints should be well cleaned and the bitumen poured in hot; it must not boil or burn, but should be heated in a metal container

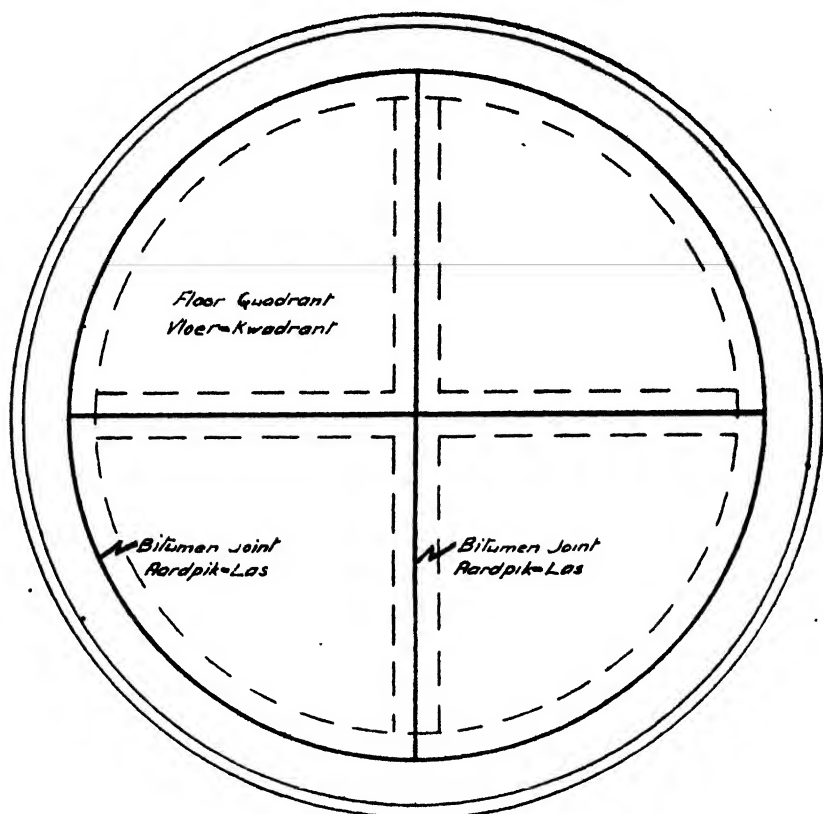


FIG. 7.—Floor quadrants showing joints for bitumen.

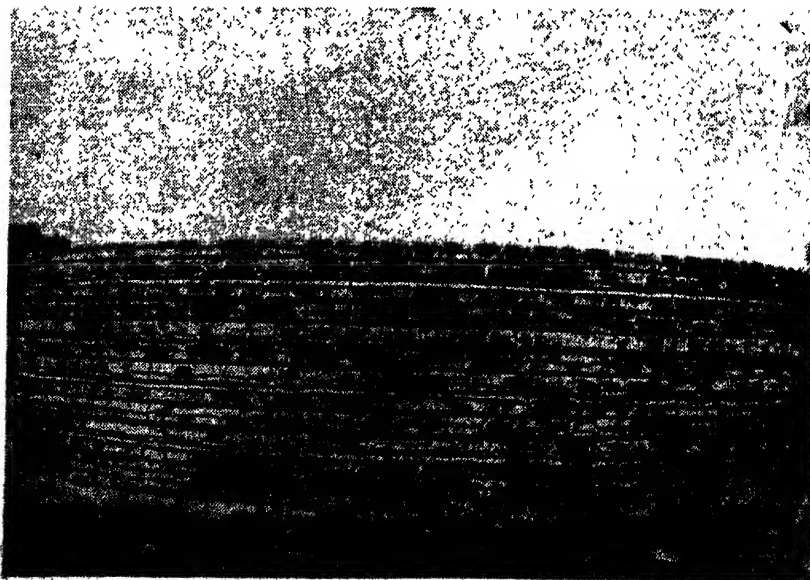


FIG. 8.—Completed wall showing reinforcing wires on outside.

REPAIR OF CORRUGATED IRON TANKS.

suspended in water over a fire. The openings should be filled to within a $\frac{1}{4}$ -inch from the floor surface. The bitumen should have 40-50 penetration.

III (b). The Permanent Repair of Corrugated Galvanized Iron Tanks and Reservoirs.

1. Clean the inside of the tank thoroughly with a steel brush and wash it with water.

2. Place the tank on a permanent smooth firm footing built of concrete or of brick or stone levelled off with cement mortar.

3. If the site is not shaded, provide shade by planting in poles and stretching a tarpaulin so as to cover the tank completely.

4. Lay a 4-inch thick concrete floor on the bottom of the tank and allow 7 days for the concrete to harden, keeping the floor wet all the time.

The concrete should consist of 1 cement to 2 clean sand to 4 small stone.

5. Mix a stiff mortar consisting of 1 cement to 2 clean fine sand and carefully fill the hollow rings of the wall of the tank only, using a small trowel. Care should be taken when entering and leaving the tank through the manhole to cause as little shaking as possible. This can be done by using a small ladder inside the tank and having a platform above the tank fixed to the poles supporting the tarpaulin.

After 12 hours the entire inside of the tank should be plastered $\frac{1}{2}$ inch thick over the ridges.

It is advisable to do the first part of the plastering late in the afternoon so that the cement sets during the cool night.

As soon as the plaster has set hard, the inside of the tank should be kept wet for 7 days before water is let in.

If desired, the outside of the tank can also be plastered. Wrap barbed wire round the tank (one wire in a groove will suffice) and fill the hollow rings. Twelve hours later plaster $\frac{1}{2}$ inch thick over all.

Corrugated galvanized iron reservoirs can be repaired in a similar way.

Ticks and Tick-borne Diseases.

Part 1.—The Argasidae and Ixodidae.

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IN many parts of South Africa ticks play so important a rôle, both by virtue of the direct effects of their attacks on animals and their indirect effects due to the diseases transmitted by them, that they may be said to constitute a limiting factor to successful farming unless vigorous efforts are made to control them.

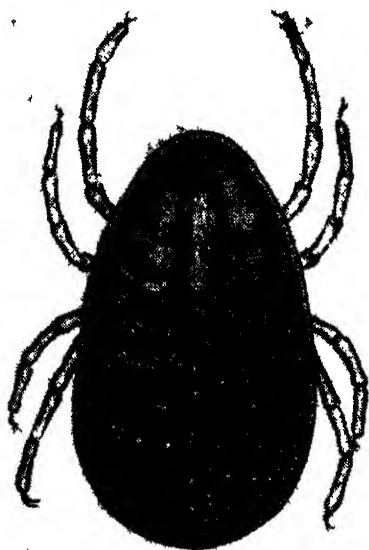


FIG. 1.—The Fowl Tick (Adult)
Magnified 8 times.

The direct effects produced by tick infestation are often more serious than is realized. When numerous, the amount of blood removed from their hosts may be so considerable as even to bring about death from exsanguination; Sir Arnold Theiler records the case of a horse which died from acute anaemia and from which 14 lb. of blue ticks were collected within 3 days. This constituted only about half the ticks which actually gorged on the animal which, therefore, lost over 2 gallons of blood from tick infestation. Tick bites in themselves are painful and very prone to invasion by secondary organisms which set up abscesses, large and deep-seated suppurating wounds and give rise to the host of injuries, such as sloughed teats, missing tips of tails, foot rot, severe and painful lameness, maggot infestation, etc.

The indirect effects are even more serious and the numerous diseases directly transmitted by ticks are responsible for enormous annual losses of live-stock throughout the country, entailing the expenditure of many thousands of pounds yearly in remedies, labour and construction work for the control of these parasites. The problems are of so complicated a nature that very intensive research work has been and still is necessary in elucidating the many and varied sides to the problem. It is with the object of bringing before the public some aspects of this problem that this article now appears, in order that, with a clear understanding of the many difficulties, the control measures advocated can be intelligently applied.

Necessity for Accurate Identification of Tick Species.

There are scarcely two tick species which may be said to be identical as regards their distribution, life histories and habits and their capacities and modes of transmission of disease. It is absolutely essential, therefore, that we should be in a position to recognize at least the species of greatest economic importance and be in possession of knowledge concerning their habits in order to be able to apply control measures with a reasonable chance of success. Furthermore, this knowledge is necessary in order that the farmer may be able to protect his business from the disastrous consequences of the introduction of a new species of tick on to his farm, or a disease-transmitting species infected with a disease, the introduction of which might ruin him.

Classification and Description of the Main Groups of Ticks.

The ticks, though often referred to as insects, are actually widely separated from them and fall within the group *Acarina* which also includes the mites. They may be readily distinguished from insects by the presence of 4 pairs of legs, no clearly defined head, thorax and abdomen, the absence of antennae or anterior feelers and the fact that the body does not show the characteristic segments of insects. They are more closely related to the spiders and scorpions.

The group or super family, which is known as the *Ixodoidea*, is divided into two families, the *Ixodidae* and *Argasidae* and within these two groups are contained the 60 species which parasite mammals, birds and reptiles in South Africa.

The *Argasidae*, which includes the tampsans, contains only 3 or 4 species which are of interest to us from the economic point of view, and its members may be readily distinguished from those of the *Ixodidae* both in appearance, habits and life histories. Argasid ticks are characterized by the fact that the outer covering, which is tough and leathery, contains no plates or shields and is more or less uniform in appearance all over the body. The mouth parts in the nymphs and adults are situated towards the front of the lower surface and are generally not visible from above. The males and females can only be distinguished from each other by the shape of the sexual orifice, which is situated on the under surface of the body between the first or second pair of legs. Eyes, when present, are four in number, situated on the supra-coxal fold. The life histories, though similar to those of the *Ixodidae* in so far that there are four stages, namely, egg, larva, nymph and adult, vary in that there are at least two nymphal stages and in some cases as many as 6 or 7. The habits of the *Argasidae* vary considerably but by far the greater number of the species do not remain attached to their hosts for any length of time, as do the *Ixodidae*, but feed for short intervals at a time and retire to their secluded places of concealment. Eggs are laid in small batches, usually after each feed.

The *Ixodidae*, which is a large group containing about 260 species of which 50 are known to occur in South Africa, includes those species of greatest economic importance to us. The species are characterized by the presence of a hard shield, which covers the entire upper surface of the body in the male and a small area at the front in the females, nymphs and larvae. The mouth parts are situated on the basis capitulum or false head and are always visible when viewed from above. Eyes, when present, are two in number

and situated on either side of the shield or scutum. The various developmental stages consist of egg, larva, nymph and adult, but the life histories vary from those of the *Argasidae* in that feeding for the particular stage is completed at one operation, which is of considerably greater duration than in the case of *Argasidae*. Eggs are laid in a single large batch.

With this brief description of the groups and their general habits the more important species may now be discussed. It is intended to enumerate only those features which will serve to differentiate the species in order that control measures based upon these facts may be intelligently applied.

The Family Argasidae.

There are only three members of this family which are of significance to us in South Africa. These are the fowl tick, the spinose ear tick and the tampan tick.

The Fowl Tick.

The fowl tick, *Argas persicus*, Oken, Fig. 1, is often wrongly spoken of as the tampan, a term which should only be applied to the human tampan to be described later. It is essentially a parasite of fowls, but occurs also on a variety of other birds and occasionally attacks man. It has a very wide distribution throughout the world and has been taken in all parts of the Union.

It is easily recognized by the elongate oval outline of the body, which is slightly more pointed in

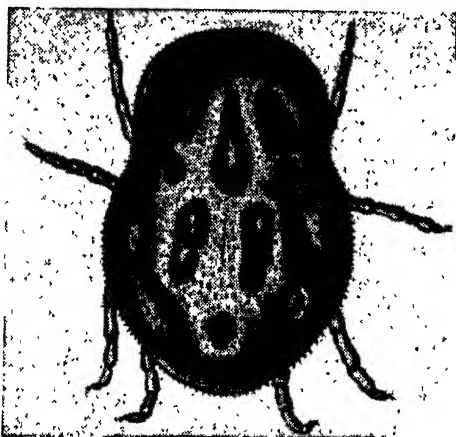


FIG. 2a.—The Spinose Ear Tick (Engorged nymph). Magnified 6 times.

front and much flattened from above to below. It occurs principally in cracks and crevices in the walls and woodwork of fowl runs or under the bark of trees.

Life History.—The females lay batches of eggs of from 20 to 100 in their places of concealment. These eggs hatch in about three weeks, and the minute pale-coloured six-legged larvae crawl about actively in search of a host. The larvae remain attached to their hosts where they engorge themselves in from 5 to 10 days and drop off to moult into nymphs. The nymphs, which have 8 legs, resemble the adults, but are somewhat smaller and may be distinguished from the adults by the absence of a sexual orifice. Two nymphal stages occur with a moult between each and the adults then appear after the final moult. Lounsbury showed the complete life cycle, from egg to egg, to occupy about 10 months in this country.



Habits.—Although the larval stage remains on the host until engorgement has been completed—a fact which is made use of in combating this species, as will be described under the appropriate section—the nymphs and adults are periodical feeders. Feeding

FIG. 2b.—The Spinose Ear Tick (Engorged Larva). Magnified 8 times.

is carried out mainly at night when the birds are sleeping on their perches or in branches of trees, and is completed in from 1 to 1½ hours. The parasite then returns to its hiding place when a moult or the laying of a batch of eggs takes place according to the stage.

Transmission of Disease.—The fowl tick is the chief transmitter of the fowl spirochaete (*Spirochaeta anserina*) responsible for spirochaetosis, a rapidly fatal disease of poultry. Infection is acquired by the tick from an infected bird, and such infected ticks may transmit the disease to susceptible birds for 6 months or longer, or the infection may pass through the egg to be transmitted in the following generation. It has been shown that infection may even pass to a succeeding generation of ticks without reinfection of the ticks.

Bedford and Coles have shown the fowl tick to be an effective transmitter of the protozoon parasite, *Aegyptianella pullorum*, which is frequently fatal to poultry and other domestic birds.

The Spinose Ear Tick.

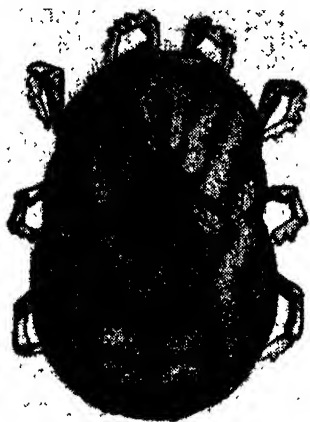
The Spinose Ear Tick (*Argas mognini*, Duges) (Fig. 2A) is a native of America, but has been introduced into many parts of the world and is to-day widely distributed in South Africa. It occurs only in the ears of its hosts in the larval and nymphal stages, the adults being non-parasitic, and is typically a species favouring a dry climate.

The larval and nymphal stages, which occur in the ears of cattle, horses, sheep, dogs and even occasionally in man, are easily recognized by their characteristic appearance. The engorged larva (Fig. 2B), is a small white or reddish pear-shaped object, usually appearing as a small translucent bladder, which is incapable of movement and hence frequently mistaken for an egg. The 6 legs are pale and inconspicuous and only distinctly seen with the aid of a pocket lens. To start with, the 8-legged nymph is pale, with the legs appearing exceptionally large in comparison with the body. The tick soon assumes a blue-gray colour and the body assumes the shape of a violin with a constriction in the middle. The parasite is much less flattened than the fowl tick and the edges are rounded. Small upright spines, particularly pronounced in front, cover the body and these serve to differentiate the species from the human tampan. The adults, which are not found in the ears, resemble the nymphs, but may be distinguished from them by the minute pits which take the place of the spines of the nymphs, the presence of a sexual orifice on the underside, and the fact that the mouth parts are only partially developed.

Life History.—The larva, which is a minute six-legged object with elongated mouth parts, crawls about actively in search of a host and makes directly for the ears, where it attaches itself deep down in the external ear. Here it engorges itself in from 5 to 10 days and then becomes quiescent until the outer skin is cast and the nymph emerges. The nymph immediately commences feeding, which may be completed in as short a period as a week, but is generally much longer. The nymphs have been observed in the ears for as long as 3 months and certain American observers state that this period may be as long as 7 months. After engorgement the nymphs leave the ears and secrete themselves in cracks or crevices in kraal or stable walls or in posts close to the ground or under the bark of trees. The nymphs moult to adults within a period of from 4 to 11 days and fertilization takes place shortly afterwards. Eggs are deposited

within a period of about 14 days and these hatch in from 7 to 56 days depending upon temperature. Although the adults are not parasitic and are unable to feed, owing to only partial development of the mouth parts, the eggs are nevertheless laid in small batches in common with the practice of other members of the family. The complete life cycle from egg to egg may be as short as 7 to 8 weeks or may occupy a period of a year or even longer.

Due, presumably, to the fact that mating of the sexes occurs away from the host, which makes it necessary for the sexes to find each other, a matter which is possible only in more or less confined spaces, infestations with ear ticks are typically kraal or stable infections and are seldom contracted in the open veld. Such localities may remain infected for several years, as this tick possesses phenomenal powers of resistance to hunger and adverse climatic conditions.



Although the spinose ear tick is not responsible for the transmission of any disease, it may be responsible for considerable economic loss and may even bring about the death of animals. Infected animals are restless and feeding is interfered with due to the constant irritation caused by the bites of the ticks and substances injected by them, and they lose condition rapidly. Occasionally perforation of the ear drum has been observed and secondary invading bacteria have penetrated the inner ear and caused death due to meningitis.

FIG. 3.—The Tampan Tick (Engorged Adult). Magnified 6 times.

The Tampan Tick.

This tick (*Argas moubata*, Murray), Fig. 3, is typically a parasite of human beings, but has been known to attack a variety of domestic animals and has even been taken off tortoises in the Kimberley area. In appearance it resembles the spinose ear tick, but may be distinguished from it by the body covering being mammillated or covered with small raised areas.

It is fairly widely distributed in the drier parts of South Africa such as the north-west Cape, Bechuanaland and the western and northern Transvaal. It is most frequently met with around trees in the dry sandy areas and is common in the Vryburg, Kuruman, Hay and Gordonia districts, but it appears to be spreading and constitutes a common infestation in native huts in many parts to-day.

Life History.—Feeding is carried out rapidly and by preference at night, but animals are frequently attacked while resting in the shade of trees. After feeding, the eggs are deposited by the females, in the ground near the bases of trees, under the bark, or in cracks in walls in native huts. Batches of eggs vary in number from 20 to over 300, and a single female has been known to lay as many as 1,217 eggs in all. Hatching occurs after 8 to 25 days and the larvae either remain within the egg shell or free themselves and remain motionless until moulting occurs 3 to 13 days later. There may be several nymphal stages, those nymphs destined to become females showing a greater number of moults than the males. In this way there may be as few as 2 or as many as 7 nymphal stages.

Transmission of Disease.—The tampan tick is the transmitter of relapsing or tick fever, caused by *Spirochaeta duttoni*, to man in various parts of Africa and there is a record of a severe outbreak of this disease in natives in the Union. It has also been shown, experimentally, to be capable of transmitting spirochaetosis, caused by *Spirochaeta anserina*, to fowls.

A closely allied species, the eyed tampan (*Argas savignii*, Audouin), which may be distinguished from the preceding species by the presence of four eyes on the supra-coxal fold, is also widely distributed in Africa, but is much less common in the Union than the eyeless tampan. It has been found attacking various species of domestic animals and man in the Steytlerville district and occasionally in the north-western Cape districts.

The Family Ixodidae.

This family includes a large number of species amongst which are included those responsible for the transmission of the most important protozoon diseases in our domesticated animals. The habit of the species of the group to remain attached to their hosts for considerable periods while feeding, make these ticks easily observed and hence, when ticks are spoken of, it is generally on the members of this family that the mind is centred.

The family *Ixodidae* is divided into a number of genera on the basis of external characters, and from the point of view of recognition

of the species it is as well to adhere to this grouping. It is possible, however, to distinguish the following three main groups based on differences in life history:—

(a) *One-host ticks*, in which the larval, nymphal and adult stages all occur on one and the same host, the moults between the stages all occur on one the tick remains attached to its host. The group includes the blue tick and the Argentine tick.

(b) *Two-host ticks*, in which the larval

and nymphal stages occur on one host and the adult on another. In this case moulting from the larval to nymphal stage generally occurs in the ears of the host, the engorged nymph then dropping from the host to moult on the ground. The adults then seek another host. The red tick and bont-legged tick are included in this group although the latter species might also act as a three-host tick.

(c) *Three-host ticks*, in which each stage completes its engorgement on a host from which it drops and moults on the ground again to attach itself in the following stage upon a new host. The bont tick, paralysis tick and the brown ticks are included in this group.

As space is limited and the intention of this article is to serve as a guide to the recognition of some of the more important of our

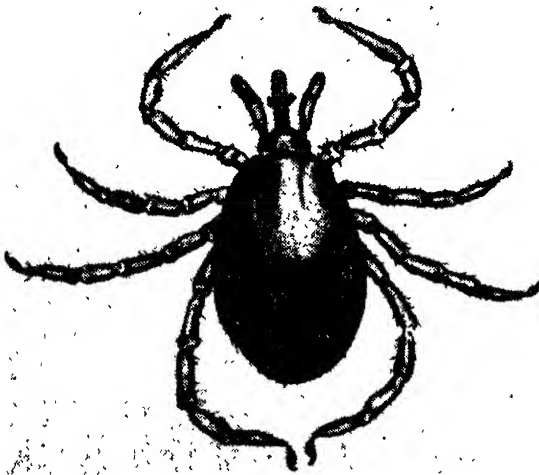


FIG. 4.—The Sheep Paralysis Tick (Partially Engorged Female). Magnified 10 times.

tick species, the various genera will not be discussed separately, but the more important species discussed in accordance with their capacities in bringing about economic loss amongst our livestock.

The Sheep Paralysis Tick.

This species (*Ixodes pilosus*, Koch), Fig. 4, is common in the grass-veld areas near the coast of the eastern Cape Province, where it is often referred to as the *russet* or *bush tick*, but has been recorded from all four provinces of the Union.

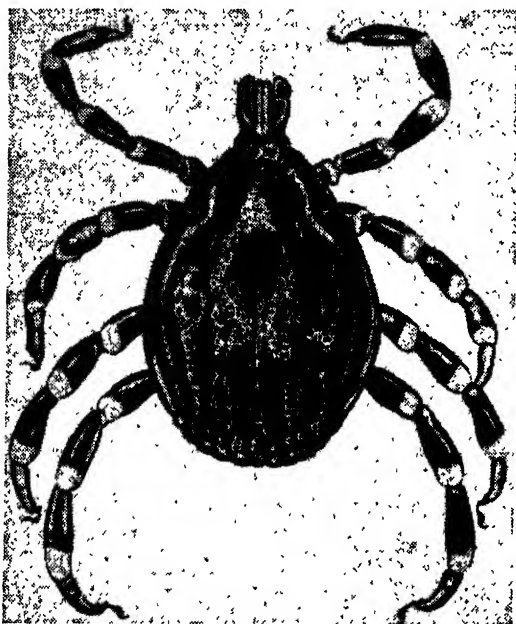


FIG. 5.—The Bont-Legged Tick (Male). Magnified 8 times.

margin of the body behind. On the under surface, in both sexes, a horseshoe-shaped groove encircles the anus in front.

Life History.—This species may be said to be predominantly a winter tick and is most active from about April to September. Three hosts are required for its cycle, the larval and nymphal stages occurring on small veld animals, e.g. hares, field mice and rats, etc., and the adults only being found on domestic stock, where they are most frequently met with on the legs and under surfaces of the neck and body. The females engorge themselves in from 5 to 7 days.

Relation to Disease.—As its name implies, this tick is capable of producing paralysis in animals, particularly merinos and goats. The cause of this paralysis is not clearly understood but it would appear to be due to some toxin secreted by certain females only, as it is frequently observed that an animal remains unaffected when literally covered with these ticks, whereas others show severe paralysis when only a single tick can be found. It has been noted in Australia that those females associated with paralysis show a marked enlargement of the salivary glands.

When the ticks are removed the paralysis generally disappears rapidly if the condition is not already too far advanced.

It is a small species, the body measuring not more than about $\frac{1}{8}$ in. in length in the un-engorged state. The colour is reddish brown in both sexes, but when engorged, the female assumes a slate-blue colour, the body takes the shape of a sphere slightly more pointed in front, and the legs appear to be crowded together close to the mouth parts. The species is easily recognized by the long and flexible mouth parts, narrower and longer in the female than in the male. The legs are relatively long and slender and eyes are absent. The male than in the male. cence of a distinct ridge encircling the

The Karoo Paralysis Tick.

This species (*Ixodes rubicundus*, Neumann) is closely related to the preceding and is difficult to distinguish from it. It may be distinguished, however, by the fact that it is generally somewhat darker in colour and by the anal groove, the arms of which are parallel instead of, as in the case of *I. pilosus*, converging towards each other behind.

It is common in the eastern central Cape Province where it occurs on the stony Karoo hills. It has been noted that the sites favoured by it are the eastern slopes of the hills which catch the morning sun and it is probably in these situations that the hosts of the immature stages, viz., the Cape red hare and the elephant shrew, are most abundant. The species has, however, been recorded from the Transvaal and Northern Rhodesia, and cases of paralysis due to it have been noted in cattle and vaal rhebok in addition to sheep and goats.

The Bont-Legged Tick.

Two varieties of this species are recognized in South Africa, namely *Hyalomma aegyptium* var. *impressum* (Koch), Fig. 5, and var. *aegyptium* (Linnaeus). These two varieties are distinguished on differences in the pitting or punctation of the shields, but as, for practical purposes, the two varieties differ little in distribution and habits, these differences are of little importance. The species is characterized by the fact that the legs are banded with white or yellowish bands, the shield in both male and female is uniformly black, hemispherical eyes are present and the mouth parts are particularly long. The species is widely distributed in the Union but occurs principally in the drier parts of the country such as the western and northern Cape areas, Orange Free State and western Transvaal.

Life History.—This tick falls into the group of the two-host ticks, although on occasion three hosts may be necessary, as the larvae might drop from the first host after engorgement instead of moulting on the host to the nymph, which is the normal procedure. The adults are found on the more hairless portions of the body, e.g. under the tails of cattle, on udders or around the claws of sheep or on the tails of the haired or bastard classes. The female completes her engorgement in about 7 days and drops off to lay from 10,000 to 15,000 eggs under stones or other sheltered places. The eggs take roughly a month to hatch and the six-legged larvae are found mainly on small field animals such as field rats and mice, hares, etc. Great powers of resistance to adverse conditions are displayed by the adults, which have been kept alive without food for two years, the nymphs for three months and the larvae for a year.

Relation to Disease.—Although this species, or a species very closely allied to it, has been incriminated in the spread of infectious diseases in other parts of Africa, so far as is known no disease-producing organism has been transmitted by it to domestic animals as yet. It has, however, been incriminated in the transmission of tick-bite fever in man. In many parts, however, the bont-legged tick is responsible for a considerable amount of damage due to the mechanical injury inflicted by it, which is frequently the site of secondary invasion by bacteria. In this way invasion of the sensitive tissues of the hooves by the necrosis bacillus, giving rise to the condition known as foot rot, frequently follows initial tick injuries to the coronet, particularly in

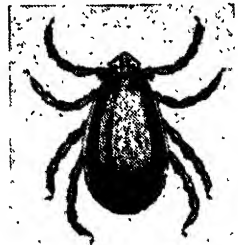


FIG. 6.—The Dog Tick (Male). Magnified 7 times.

sheep in the north-western Cape. Painful swellings followed by severe lameness are often associated with tick bites behind the shoulder and such infections of tick bites frequently lead to the sloughing of teats from udders or the tips of tails, depending upon the site of attachment of this species. On account of the long mouth parts and the severe inflammatory zone surrounding the bite, such tick bites are very prone to attack by the cattle maggot fly, *Chrysomya bezziana*, in the northern Transvaal, and vigorous efforts at the control of this and other species of ticks are being demanded of the farming community.

The Dog Tick.

The dog tick (*Haemaphysalis leachii*, Audouin), Figs. 6 and 7, is a small light brown species which is easily recognized by its short mouth parts, the palps of which are triangular in shape, the absence of eyes and the absence of adanal plates or shields towards the back of the under-surface of the males. The engorged females are roughly $\frac{1}{4}$ to $\frac{3}{8}$ inch in length, grayish blue in colour, with the characteristic short triangular mouth parts and when lifted from their sites of attachment often disclose the presence of a male situated underneath them.

Distribution.—This species is widely distributed throughout Africa and is common in South Africa, where it is essentially a parasite of dogs and cats and wild animals of the dog and cat tribes. In some districts of the Cape Province, particularly Oudtshoorn, its place, as the principal dog tick, is to some extent taken by the russet or paralysis tick, whereas in the Zoutpansberg district of the Transvaal the tropical dog tick (*Rhipicephalus sanguineus*), to be described later, often supersedes it.

Life History.—The dog tick is a three-host tick, the larvae and nymphae both dropping from the host to moult on the ground. The female, after engorging, which takes 5 to 6 days, drops to the ground where, after about 3 to 7 days, depending upon climatic conditions, she commences laying on an average about 5,000 eggs and then dies. The eggs hatch after about a month and the larvae feed for a period of from 2 to 7 days when they drop from their host and moult to the nymphal stage. The nymphs engorge in from 2 to 7 days, drop and moult to adults in about two weeks. The males may remain attached to their hosts for long periods after the females have dropped and, as is characteristic for the males of the *Ixodidae* in general, where the hard outer covering allows of little expansion, take very little blood.

Relation to Disease.—This tick is the chief transmitting agent of the highly fatal biliary fever or piroplasmosis of dogs in South Africa caused by *Piroplasma canis*, a blood parasite specific to dogs and jackals. The infection is derived by females from infected dogs and

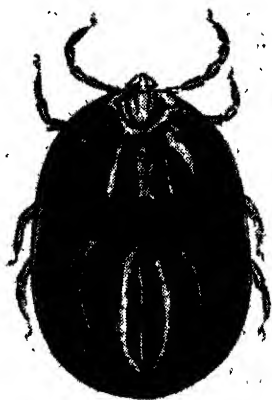


FIG. 7.—The Dog Tick (Engorged Female). Magnified 4 times.

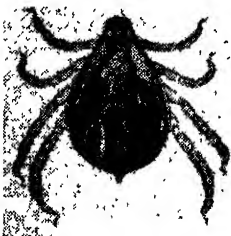


FIG. 8.—The Blue Tick (Male). Magnified 7 times.

passes through the egg stage to the next generation, where neither the larva or nymph is capable of transmitting it but only the adults. A somewhat similar disease of cats caused by the blood parasite *Nuttallia felis* is probably also dependent upon this tick for its transmission. The larvae are capable of transmitting tick-bite fever to man.

Transkei Cattle Tick.

This tick (*Haemaphysalis silacea* Robinson) is a related species which occurs principally on cattle and is rather rare and confined to a few districts in the south-eastern Cape Province. It may be distinguished from the foregoing by the shape of the mouth parts which, though short, do not show the triangular appearance characteristic of the dog tick. One other species of this genus (*Haemaphysalis aciculifer* Warburton) has been recorded principally from cattle on the eastern slopes of the Drakensberg in the Pilgrims Rest district of the Transvaal. In this species the palps show a tendency towards being triangular in shape and the male is provided with a long pointed spur on the 4th coxa or basal portion of the fourth leg. These two species have not been shown to be associated with the transmission of disease to livestock.

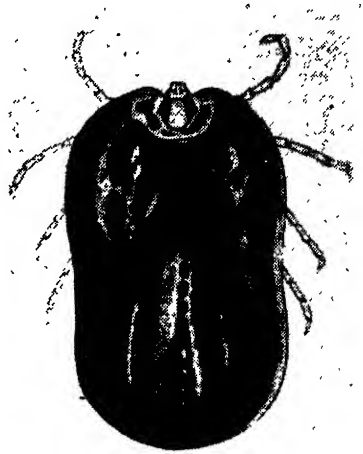


FIG. 9.—The Blue Tick (Engorged Female). Magnified 5 times.

The Blue Tick.

This tick (*Boophilus decoloratus* Koch), Figs. 8 and 9, is one of the commonest species in the Union although it is rare in Zululand and does not occur in some of the very arid regions. It occurs all over the heads, necks and bodies of cattle and horses but is found more rarely on sheep, goats and dogs.

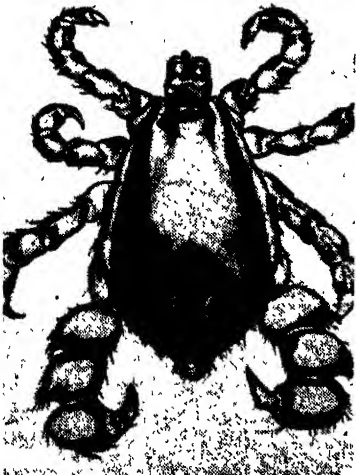


FIG. 10.—The Argentine Tick (Male).

Description.—This species is characterized by the possession of very short mouth parts and pale yellow legs. The males are small, roughly $\frac{1}{8}$ inch in length, pale brownish yellow in colour and are generally to be found attached to the skin underneath the females. Eyes are present and the areas surrounding them are generally slightly reddish or brownish, particularly in the female. The male is further characterized by the presence of strongly pointed adanal shields on the lower

surface and also a pair of accessory adanal shields on either side, and the body ends posteriorly in a short though distinct tail or median pointed prolongation. The female when engorged is bluish in colour, elongated, with frequently a slight constriction about the middle, giving it a characteristic appearance, and is roughly $\frac{1}{2}$ inch in length.

Life History.—One host only is required for the completion of the parasitic stage, the larvae attaching themselves to the skin where, after engorgement, they moult to nymphs which in turn moult to adults without any material change of position. The complete life cycle on the animal occupies a period of from 22 to 38 days, depending upon the season of the year and the average period between the attachment of the larvae and the appearance of the first engorged adult females is 23 days. After engorgement the female drops from the host and egg-laying, which comprises from 1,000 to 2,500 eggs, commences after approximately six days. The eggs hatch in about 6 weeks' time giving rise to minute six-legged larvae, which crawl about actively in search of a host. These larvae have been kept alive without food for six months but will normally not survive for more than 3 months.

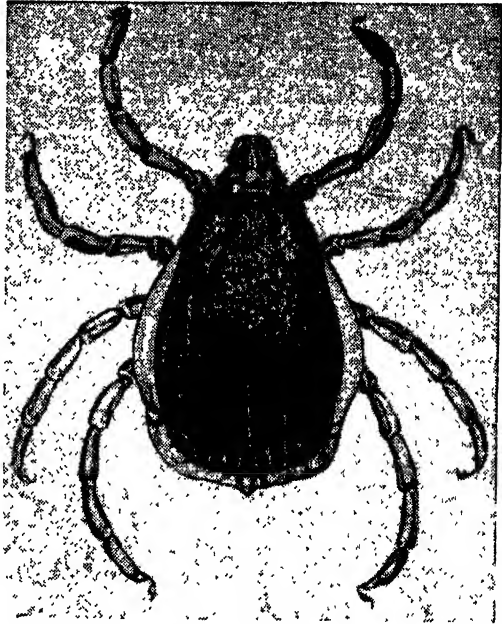


FIG. 11.—The Red Tick (Male). Magnified 9 times.

Relation to Disease.—The blue tick is the principal transmitting agent of redwater and gallsickness to cattle in South Africa, caused by *Piroplasma bigeminum* and *Anaplasma marginale* respectively. It is, furthermore, a transmitter of spirochaetosis to cattle, horses and sheep caused by *Spirochaeta theileri*. The mode of transmission is by the larvae of the ensuing generation after the infection has been acquired by one or other of the stages of the preceding generation. It has also been demonstrated that the infection may be transmitted by the larvae of the third generation, in the event of the infective larvae completing development on a non-susceptible animal such as a horse. European redwater or babesiosis has of recent years made its appearance in the Union due, possibly, to the introduction of the causal agent, *Babesia bovis*, by means of imported cattle and although the transmission has not yet been proved, the blue tick is probably one of the vectors. Tick-bite fever in man (*Rickettsia* species) is also transmitted by this tick.

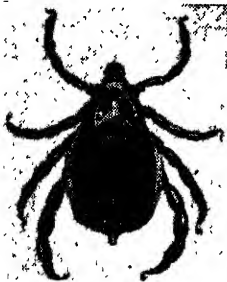


FIG. 12.—The Brown Tick (Male). Magnified 5 times.

The Argentine or Lounsbury's Tick.

The males of this species, (*Margaropus winthemi*, Karsch), Fig. 10, are easily recognized by the excessive development of the 4th pair of legs, the segments of which are enormously thickened. The species is pale yellowish or brownish and the legs in both sexes are pale with dark bands at the joints. The females may be distinguished from those of the blue tick by their larger size and the banded and relatively stouter legs.

Distribution.—This tick is not indigenous to the country but is believed to have been imported from its habitat in the Argentine on horses and mules during the Boer War. It is a fairly common species to-day on horses in parts of the Orange Free State, Basutoland and the Graaff-Reinet district of the Cape Province, but has on several occasions been found on cattle, notably in the Kuruman district.

Life History.—This has not been worked out as yet, but like the blue tick, this species has been shown to require only one host for its development. Unlike the blue tick, however, it is always more active in the winter months and high temperatures appear to affect it adversely.

There is reason to believe that it is associated with the transmission of redwater to cattle although this has not yet been proved.

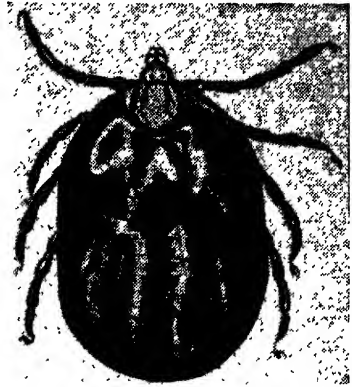


FIG. 13.—The Brown Tick (Engorged Female). Magnified 5 times.

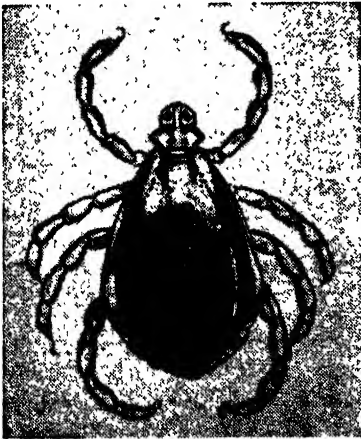


FIG. 14.—The Tropical Dog Tick (Male). Magnified 10 times.

unengorged female, whereas the engorged female is bluish with a brownish tinge.

The species occurs on the hairless portions of the body and is most frequent under the tail and around and below the anus.

Life History.—Two hosts are required for the completion of the life cycle. The female, upon engorgement, drops from the animal

The Red Tick.

The red tick (*Rhipicephalus cecrops*, Neumann), Fig. 11, is probably the commonest and most widely distributed tick on cattle and horses in South Africa.

Description.—It is a medium-sized species and is characterized by its red legs, which distinguish it from other members of the genus. Eyes, which are hemispherical in shape, are present and the shield is very dark brown or black with very numerous small pits, many of which are confluent, covering the surface. The mouth parts are short, as is characteristic of this group. The body of the males, other than the shield, is red as is that of the

and lays from 5,000 to 7,000 eggs which hatch in about 30 days in summer. The larvae attach themselves in the ears of their hosts and, after engorgement, moult to nymphs in this position. The period occupied for engorgement of the larvae and nymphs is from 10 to 15 days, after which the engorged nymphs drop to the ground and moult into adults in from 22 to 25 days.

The larvae can withstand starvation for up to 7 months and the adults for about one year.

Relation to Disease.—This species may be placed second in importance to the blue tick as a transmitter of redwater (caused by *Piroplasma bigeminum*) to cattle. The infection is derived in the larval or nymphal stage from a reacting animal and transmitted by the adult, or the infection may be acquired in the adult stage, pass through the egg, and be transmitted by the larvae of the ensuing generation. Biliary fever of horses, caused by *Nuttallia equi*, is acquired by this species in the larval or nymphal stage and transmitted by the adult. Experimentally the red tick has been proved to be able to transmit East Coast fever (*Theileria parva*) to cattle, but probably plays a minor rôle in this respect in Nature. Furthermore, the species transmits *Theileria mutans*, which produces a mild form of gallsickness, characterized by a mild temperature reaction and slight anaemia. It also transmits spirochaetosis (*Spirochaeta theileri*) to cattle, horses and other classes of domestic animals.

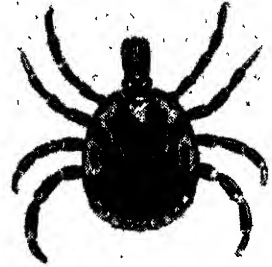


FIG. 15.—The Bont Tick (Male). Magnified 4 times.

The Brown Tick.

This species (*Rhipicephalus appendiculatus*, Neumann), Figs. 12 and 13, differs from the red tick in having brown legs, which also characterize the other members of this group. Apart from minor differences, which require the aid of a pocket lens to determine, the males may be differentiated by the fact that the punctations on the shield are more dense towards the centre and a small space devoid of punctations is present on either side. The fourth pair of legs is generally somewhat thickened, although this is not a constant character, and when engorged the male bears a distinct pointed tail behind. The females, which are uniformly brown when unengorged, assume a slate blue colour when engorged but can only be distinguished from the other members of the group, apart from the red tick, by an expert. It is advisable, therefore, to identify this species by the male which may generally be found underneath the female.

Distribution.—This tick is widely distributed in South Africa but is more abundant in the lower-lying areas of the eastern and northern portions of the Union, where it occurs on a variety of domestic and wild animals, being confined mostly to the head region, such as the ears and around the eyes. When numerous, however, the ticks may be distributed over the body as well.

Life History.—The brown tick is a three-host tick, the larvae and nymphae occurring chiefly in the ears of their hosts, which are typically cattle. The female engorges herself in from four days to a week or more depending upon climate. She lays from 3,000 to 6,700 eggs on the ground which hatch in about 28 days in summer to several months in winter. The larvae engorge in from 3 to 7 days, drop and moult to nymphs in 2 to 3 weeks. The nymphs remain on their hosts from 3 to 7 days and in from 10 to 18 days

moult to adults which engorge in from 4 to 8 days. The larvae withstand starvation for 7 to 11 months, the nymphs for about 6½ months and the unengorged adults for an average period of 12 to 14 months.

Relation to Disease.—This species is the principal transmitter of the highly fatal East Coast fever of cattle caused by *Theileria parva*. The infection is acquired by the larva and transmitted by the resulting nymph or acquired by the nymph and passed on by the adult. The larvae of the ensuing generation are not infective even though a female may have engorged herself on a reacting animal. The infection is passed on to the susceptible animal only after the infective nymph or adult has been feeding for roughly 72 hours and, upon completion of the feed, the tick has lost all of the infection. As with the red tick this species transmits redwater (*Piroplasma bigeminum*), and mild gallsickness (*Theileria mutans*), to cattle. In addition it has been shown to transmit Nairobi sheep disease, an infectious gastro-enteritis of sheep caused by an ultra-visible virus, in Kenya Colony and, experimentally, it can transmit the virus disease of sheep, Louping Ill, which occurs in Great Britain.

Other Species of Brown Ticks.

The Cape brown tick (*Rhipicephalus capensis*, Koch) and the black-pitted tick (*Rhipicephalus simus*, Koch) are closely allied to the brown tick from which they are not easily distinguishable by the uninitiated nor, for practical purposes, is this of much importance as they are both three-host ticks and both capable of transmitting East Coast fever. In addition the black-pitted tick has been shown to transmit gallsickness of cattle caused by *Anaplasma marginale* and further research will no doubt reveal their capacities for transmitting other diseases as well. The Cape brown tick has a slightly lighter shade of brown than the brown tick, and the shield is densely covered with closely set punctations or pits, whereas the black-pitted tick is a very dark brown and the punctations are very much fewer in number and, in the male, arranged in irregular longitudinal rows.

Distribution.—The Cape brown tick occurs principally in the extreme western Cape Province and extends more or less along the coastal areas into Natal, although it has been taken in other localities but is not common. The black-pitted tick occurs more or less over the whole Union except the drier western portions. Both species occur on the larger domestic animals and several species of wild game and small veld animals, but the black-pitted tick is commonly encountered on dogs as well.

Recently a new species of tick has been discovered in the Aberdeen district and in a few localities in the eastern Cape Province, which has been named *Rhipicephalus glabroscutatum*,

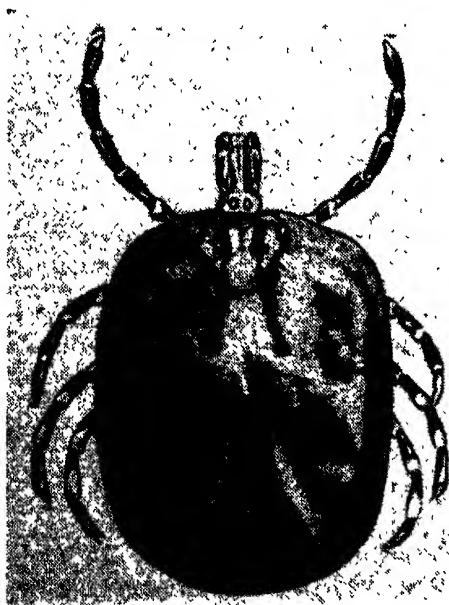


FIG. 16.—The Bont Tick (Engorged Female). Magnified 5 times.

du Toit, due to the shiny nature of the shield, which is almost entirely devoid of punctations. The species may be distinguished further from the preceding 3 species by the hemispherical eyes as opposed to the flat eyes of the other species.

This tick has been found to occur in clusters around and between the claws of sheep where it has been responsible for a low grade lameness, and has also been taken on steenbuck. It has not been shown to be associated with the transmission of disease.

The Tropical Dog Tick.

This tick (*Rhipicephalus sanguineus*, Latreille), Fig. 14, also known as the European brown tick, is closely related to the brown tick, from which it may be distinguished by its smaller size and the fact that punctations of irregular size are scattered more or less evenly over the surface of the shield. It is not very common in the Union and is found mainly on dogs kept in kennels. Houses in which dogs are allowed to sleep sometimes become infested with this tick. In the Zoutpansberg district of the Transvaal this species appears to occur fairly commonly on dogs and many species of wild animals in the open, and further northwards, and in East Africa, largely takes the place of *Haemaphysalis leachii* as the common tick occurring on dogs.

Life History.—It is a three-host tick, the females laying 1,400 to 3,400 eggs in crevices in woodwork, etc., or underneath old plaster, whitewash or paper on walls or under stones, etc., in the open. The eggs hatch in from 17 to 19 days and the larvae engorge in about 4 days. The moult to the nymphal stage occupies from 5 to 8 days and nymphs remain on their host for 4 to 5 days after which they moult to adults in about 12 days. The females remain on their hosts for 7 to 21 days and the males generally longer.

Relation to Disease.—This tick is capable of transmitting biliary fever to dogs caused by *Piroplasma canis*, the infection being acquired in one stage and passed on by the next or, the infection, acquired by the females, may be passed on by the larvae of the ensuing generation. Although this tick is by no means common on cattle it has been shown to be able to transmit gallsickness (*Anaplasma marginale*), the infection being taken up by the larvae and transmitted by the nymphs. In North Africa this species has been shown to be able to transmit rickettsiosis of dogs, a highly fatal disease caused by *Rickettsia canis*. As this disease has been recorded in dogs in the Transvaal, particularly in the eastern lowveld, care should be exercised in introducing sick animals from those areas into areas where this tick occurs. In addition, the protozoon parasite *Hepatozoon canis*, which is responsible for a mild anaemia and slight fever in dogs, has been shown to be transmitted by this species of tick, the infection being acquired in the larval or nymphal stage and transmitted in the ensuing stage but not passing through the egg stage to the following generation. This tick has been shown to be associated with the transmission of tick-bite fever to man and is particularly dangerous in this respect, as houses in which dogs sleep may become infested by it.

The Bont Tick.

This tick (*Amblyomma hebraeum*, Koch), Figs. 15 and 16, together with the other members of the genus *Amblyomma* are among the most striking members of the family Ixodidae in South Africa due to the bright coloration of the shields of both males and females.

Description.—The bont tick males and females have a scutum of

which the ground colour is yellowish with a red or green tinge and which bears conspicuous dark brown or black markings. The legs are banded with yellow, which is particularly evident in the females. The mouth parts are long, eyes are present and flat and the under-surface bears no adanal plates or shields in the male. The festoons at the hind margin of the body of the males are uniformly white or very pale yellow.

Life History.—This is a three-host tick and the engorged female, which is dark slate blue in colour and may reach a length of about $\frac{3}{4}$ inch, may lay as many as 18,500 eggs. The eggs hatch in from 7 to 10 weeks or longer depending upon temperature and the larvae engorge upon their host for a period of from 4 to 20 days. The nymphs also take from 4 to 20 days to engorge and moult in anything from 18 to 25 days with records of up to 160 days. The females remain on their host for 6 to 25 days and the males may remain attached for periods of up to 8 months.

The larvae may withstand starvation for almost a year, the nymphs for 180 to 250 days and the adults for almost two years.

Distribution.—This tick is typically a species of warm climates and even though accidentally introduced into areas where the winters are severe, invariably dies out. In the Union it occurs in the middle and lowveld areas of the northern, north-western and eastern parts of the Transvaal, throughout Swaziland, Natal (except for the higher-lying western section where the winters are severe), and the coastal areas of the Cape Province as far south as about Port Elizabeth. It occurs on a large variety of animals, practically all our domestic animals being subject to attack, as well as wild species of animals.

Relation to Disease.—The bont tick is the transmitter of heartwater to cattle, sheep and goats, a disease which is often a limiting factor to successful farming in many parts of the Transvaal particularly. The infection is acquired from a reacting animal by the larval or nymphal stage and transmitted by the nymph or adult respectively. An infected nymph may feed on a non-susceptible animal such as a horse or donkey without losing its infection and then pass the infection to a susceptible animal as an adult. The infection does not pass through the egg, so that the adult females engorging themselves on a reacting animal and dropping to lay eggs, constitute no source of danger, as the resulting larvae are not infective.

Larvae of the bont tick have been incriminated in the transmission of tick-bite fever to man, caused by a species of rickettsia not unlike that of the eastern strain of Rocky Mountain Spotted Fever of the U.S.A. In this case the infection presumably passes through the egg.

In addition to its capacity for the transmission of heartwater to cattle, sheep and goats the bont tick inflicts deep-seated and painful wounds owing to the long mouth parts. Such wounds are liable to become infected by bacteria which lead to suppuration and abscess formation, or the eggs of blowflies, particularly *Chrysomya bezziana*, may be laid in and around them leading to severe infestation by maggots which greatly extend the initial wound and necessitate vigorous intervention to prevent more serious consequences.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the Crops and Markets Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:

- (1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
- (2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
- (3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
- (4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor, Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26

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Price Review for January 1947.*

Fruit.—A larger selection of deciduous fruits reached the markets. Consignments of apples, peaches, plums, grapes and apricots were, however, barely moderate and were in strong demand. The maximum wholesale and retail prices at which pears, grapes and plums could be sold in the controlled areas, were fixed during the month. Watermelons and sweet melons were plentiful, especially on the Johannesburg and Port Elizabeth markets, and prices eased considerably. Good supplies of mangoes, papaws and pineapples were on offer. Granadilla and avocado arrivals were, however, limited, and high prices were realized.

Tomatoes.—The markets were well supplied with tomatoes and prices were relatively low, mainly in consequence of the high percentage of poor quality.

Onions.—Larger consignments reaching the markets brought about further price reductions. On the Johannesburg market the prices of Transvaal onions declined from 16s. 8d. to 14s. 9d. per bag; those of Cape onions on the Cape Town market from 12s. 4d. to 11s. 5d. per bag; and those of local onions on the Durban market from 19s. 8d. to 15s. 6d.

Potatoes.—Potatoes appeared in still greater quantities and prices showed a further decline. For example, on the Johannesburg market, the prices of Transvaal potatoes, grade I, fell from 18s. 11d. to 12s. 4d. per bag; those of Natal potatoes on the Durban market from 26s. 6d. to 15s. 1d. per bag; and those of Cape potatoes on the Cape Town market from 19s. 4d. to 15s. 6d. per bag.

Vegetables.—The Johannesburg and Pretoria markets were well supplied, especially with pumpkins, Hubbard squashes, green beans, green peas, beetroot and carrots. On most of the other markets vegetable offerings were, however, too small to meet the particularly good demand, and prices throughout remained high.

* All prices mentioned are averages.

Seeds, Grain and Fodder.—Teff hay of good quality was scarce, while forage was virtually unobtainable. Large quantities of lucerne hay were on sale and the demand steadily weakened.

Eggs and Poultry.—Eggs were fairly plentiful on the Johannesburg market yet relatively scarce on the other markets, and prices were generally high. Further increases in the maximum wholesale and retail prices of eggs were announced at the beginning of February.

Index of Prices of Field Crops and Pastoral Products.

The above index which appears elsewhere in this issue, increased from 200 for the previous month to 202 in January 1947.

The most important changes occurred in the following groups.

(a) "Other Field Crops", i.e. potatoes, onions, sweet potatoes and dry beans, decreased from 236 to 174 as a result of a further price decrease in the case of potatoes.

(b) "Pastoral Products" increased from 168 to 178 as a result of a small increase in the average wool prices.

(c) "Slaughter Stock" decreased from 208 to 200 as a result of the reduction in the seasonal price of slaughter cattle in controlled areas.

(d) "Poultry and Poultry Products" increased from 201 to 237 in January, due particularly to a further increase in the prices of eggs.

Agricultural Conditions in the Union during January, 1947.

Weather Conditions.—Good rains occurred in many parts of the summer-rainfall areas, but the rains occurred as heavy showers and were accompanied by hail which caused damage to summer cereal crops in certain parts. In many areas the withering heat scorched everything and light soaking rains were required to bring relief in these areas. In the southwestern coastal areas in particular, severe drought conditions prevailed.

Crops.—Young summer cereal crops were still very promising, but in most cases urgently needed rain, particularly in the western Transvaal and Northwestern Orange Free State. Timely showers later in the season will ensure that a good maize crop is harvested.

Stock and Pastures.—The condition of stock was generally fair. In the Karoo, however, farmers have already suffered stock losses as a result of the poor pastures, and some have had to trek with their stock to areas with better grazing.

Review of the Wool Market during January 1947.

DURING January 1947 a total of 95,373 bales of wool was offered for sale in Union ports, of which 74,589 bales (78 per cent.) were sold.

Competition was keen for wool of good quality, particularly spinning wool which was offered in limited quantities. The average prices were in most cases somewhat higher than those of the previous month.

Mealie Control Measures.

The permit requirements in regard to the acquisition and disposal of mealies and mealie products in the Union were withdrawn as from 7 February 1947 (See *Government Gazette Extraordinary* of 7 February, 1947). The other regulations, however, relating to the control over mealies still remain in force. Producers may sell only to the Board or its agents, while the restriction on the consumption of pure white mealie products still remains in force..

The Deciduous Fruit Estimates : January 1947.

Except for a few light showers, drought conditions prevailed in the western Cape Province and began to assume serious proportions. The position was also aggravated by withering winds which frequently occurred.

Crop Prospects.

Peaches.—Practically all free-stone peaches have already been harvested. As regards cling-stone varieties, it appeared that in all parts Elberta yields would be fair. Tuscan Cling, the earliest commercial cling-stone, was, however, generally disappointing.

Japanese Plums.—Mid-season varieties, particularly Gaviota, were moderate, while late plums were generally satisfactory.

Prunes.—Yields were heavy, but owing to the shortage of irrigation water in certain areas the fruit will be smaller than was originally expected.

Pears.—Taken on the whole, the present season appears to be one of the best for pears. It seems that only one variety, viz. Josephine de Malines, is giving disappointing yields this year, but as this variety is cultivated on only a comparatively small scale, little difference will be made to the overall crop.

Apples.—Good average crops are expected. In the Koo area the apples will be probably on the small side owing to the drought conditions.

Grapes.—Until the end of January it did not appear that the drought conditions had had any marked effect on the table grape crop. In the Hex River Valley the water supply, including borehole water, began to decrease rapidly. Unless heavy rains fall in time it is feared that late varieties such as Barlinka will not ripen normally and that berry formation will be poor. Waltham Cross is exceptionally good everywhere as regards quality and quantity. On the other hand, Black Prince is poor, and in most areas Hanepoot as well.

The *raisin* and *wine outputs* will undoubtedly be seriously affected by the drought. In the Worcester district a decrease of approximately 25 per cent. as compared with last year's output is expected, while those parts of Robertson which do not fall under the Brandvlei canal, will only have half a crop this year. The same applies to Montagu.

Pests.—The codling-moth position remains satisfactory in consequence of a season relatively unfavourable for the moth and the improved control methods carried out by farmers. Estimates in large commercial orchards in Groot Drakenstein, Ceres and Elgin indicate that the moth infection for Bon Chretien pears is under 5 per cent. this year. Even for the late pear and apple varieties the final infection is expected to be light. In the Hex River Valley mealy bugs in vineyards again appear to be more serious than usual.

(Particulars furnished by the Western Province Fruit Research Station.)

Marketing.

As from 27 January 1947 the maximum wholesale and retail prices at which pears, grapes and plums may be sold in uncontrolled areas have been fixed.

(For particulars see *Government Gazette Extraordinary* of 24 January 1947).

Argentine Deciduous Fruit Export.

According to the most recent figures available, the Argentine export of deciduous fruits increased by 54 per cent. over the 1945 season, viz., from approximately 37,680 tons to 58,230 tons. The increase was chiefly in the case of apples, viz., from approximately 17,480 tons to 26,360 tons; pears from 15,590 tons to 26,180 tons; and grapes from 3,350 tons to 4,200 tons.

The table below shows the most important countries of destination and the total quantity exported to each:—

	1945 JAN.-OCT. (short tons)	1946 JAN.-OCT. (short tons)
Brazil	28,160	33,850
U.S.A.	7,500	8,000
Sweden	—	14,320
Switzerland	—	950
Other countries	2,020	1,110
TOTAL	37,680	58,230

A noteworthy feature is the increase in the export to the two European countries Sweden and Switzerland.

Maximum Prices of Eggs.

THE maximum wholesale and retail prices of eggs in controlled areas, as fixed on 20 December 1946 *Sec Crops and Markets* of February 1947, have been increased by 4d. and 5d. per dozen respectively for each grade. These prices have been increased all round by a further 4d. per dozen for each grade as from 7 February 1947. Prices are now as follows:—

	Maximum Price per Dozen.	
	Wholesale.	Retail.
Grade I—	s. d.	s. d.
(a) Extra Large.....	3 7	3 11
(b) Large.....	3 5	3 9
(c) Medium.....	3 3	3 7
(d) Small.....	3 1	3 5
Grade II—		
(a) Large.....	3 3	3 7
(b) Medium.....	3 1	3 5
(c) Small.....	2 11	3 3
Grade III—		
Mixed.....	3 0	3 0

The maximum price at which eggs may be sold in uncontrolled areas has been fixed at 3s. 5d. per dozen. See *Government Gazette Extraordinary* of 7 February 1947.

The maximum wholesale and retail prices of chilled eggs in the Union, as fixed on 22 February 1946, were discontinued as from 15 November 1946, but have again been fixed as follows as from 17 January 1947:—

CROPS AND MARKETS.

	Maximum Price per Dozen.	
	Wholesale.	Retail.
	s. d.	s. d.
Grade I—		
(a) Extra Large.....	2 6	2 9
(b) Large.....	2 4	2 7
(c) Medium.....	2 2	2 5
(d) Small.....	2 0	2 3
Grade II—		
(a) Large.....	2 2	2 5
(b) Medium.....	2 0	2 3
(c) Small.....	1 10	2 1
Grade III—		
Mixed.....	1 11	1 11

(See Government Gazette Extraordinary of 17th January, 1947.)

Review of the 1945-46 Cotton Crop.

(Compiled by the Office of Cotton Grading, P.O. Box 956, Durban). CLIMATIC conditions during the normal planting time were most unfavourable. There was a severe drought during the early part of the season, followed by rains throughout January and February. The yield per acre was thus much below the average.

The prospects for the coming season are much more favourable owing to good rains and a larger acreage being planted. As per ginner's returns the total crop for 1945-46 amounted to 136,115 lb. lint or 274 running bales.

Compared with those of previous seasons, the details are as follows:—

	1945-46.	1944-45.	1943-44.	1942-43.	1941-42.
Running bales.....	274	293	525	472	710
Statistical bales (500 lb.) . . .	272	270	530	467	683
Lint (lb.).....	136,115	135,087	264,989	233,439	341,413
Seed cotton (lb.).....	406,969	405,790	768,035	699,334	1,067,105
Seed [delinted and undelinted (lb.)].....	258,646	230,154	429,142	425,295	672,348
Linters (lb.).....	23,604	22,598	40,515	31,948	62,631

Production in different areas, with the last two seasons' figures for comparison, is as follows:—

	Seed Cotton (lb.)		
	1945-46.	1944-45.	1943-44.
Natal and Zululand.....	—	36,149	129,144
Rustenburg area (including Pretoria and Marico) . . .	1,624	12,947	5,633
Northern Transvaal (including Waterberg, Pietersburg and Zoutpansberg).....	—	—	20,992
Eastern Transvaal (including Middelburg, Lydenburg and Barberton).....	395,285	354,762	599,825
Cape Province.....	—	1,932	12,441
Swaziland.....	6,450	—	—

GRADING.

Comparison of Staple.	1945-46.	1944-45.	1943-44.	1942-43.
	Per Bales. cent.	Per Bales. cent.	Per Bales. cent.	Per Bales. cent.
1½ inch and above.....	— —	3 1·02	— —	23 4·87
1⅝ inch.....	— —	— —	2 0·38	— —
Full 1½ inch.....	6 2·19	— —	— —	13 2·75
Good 1½ inch.....	195 71·17	277 94·54	476 90·67	337 71·40
1⅝ inch.....	73 26·64	13 4·44	47 8·95	99 20·98
1⅞ inch and below.....	— —	— —	— —	— —
TOTAL.....	274 100	293 100	525 100	472 100

Comparison of Grades of Good Colour Cotton.	1945-46.	1944-45.	1943-44.	1942-43.
	Per Bales. cent.	Per Bales. cent.	Per Bales. cent.	Per Bales. cent.
Middling fair.....	— —	— —	— —	— —
Strict good middling.....	46 16·79	90 30·72	8 1·52	42 8·90
Good middling.....	116 42·34	91 31·06	191 36·39	80 16·95
Strict middling.....	96 35·04	89 30·37	240 45·71	119 25·21
Middling.....	7 2·55	10 3·41	35 6·67	36 7·63
Strict low middling.....	— —	— —	— —	— —
Good colour.....	265 96·72	280 95·56	474 90·29	277 58·69
Fair colour.....	— —	— —	— —	— —
Very light spotted	9 3·28	1 34	42 8·00	106 22·46
Other off-colour.....	— —	12 4·10	9 1·71	89 18·85
TOTAL.....	274 100	293 100	525 100	472 100

CROPS AND MARKETS.

Index of Prices of Field Crops and Animal Products. (Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Com- bined index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
WEIGHTS.	19	18	2	3	34	6	17	6	100
1938-39.....	92	109	96	89	79	102	108	94	93
1939-40.....	86	114	77	95	115	105	108	89	104
1940-41.....	108	120	106	156	102	108	110	103	109
1941-42.....	120	144	143	203	102	131	135	136	124
1942-43.....	160	157	144	159	122	147	168	167	147
1943-44.....	170	186	137	212	122	154	185	188	159
1944-45.....	183	186	160	231	122	177	179	184	164
1945-46.....	201	194	164	312	118	198	185	170	170
1946—									
January.....	198	194	191	347	118	204	188	204	174
February.....	198	194	158	305	118	186	184	224	171
March.....	198	194	160	280	118	186	181	241	171
April.....	198	194	176	298	118	186	180	279	174
May.....	249	194	170	284	119	186	177	289	184
June.....	246	194	178	237	119	218	178	260	184
July.....	245	194	182	303	120	231	183	193	182
August.....	242	194	181	319	120	231	188	164	181
September.....	243	194	183	351	163	231	196	156	198
October.....	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December.....	242	210	157	236	168	194	208	201	200
1947—									
January.....	242	210	156	174	178	194	200	237	202

(a) Malze and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and tef hay.

(d) Potatoes, sweet potatoes,
onions and dried beans.
(e) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and
condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Index of Prices Paid for Farming Requisites.

Year and Month.	Imple- ments.	Ferti- lizers.	Fuel.	Bags.	Feeds.	Fencing Material.	Dips and Sprays.	Building Material.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Basis—								
1936-38...	100	100	100	100	100	100	100	100
1942.....	123	157	140	206	136	229	117	168
1943.....	144	171	154	237	152	239	127	179
1944.....	161	184	156	307	155	240	134	184
1945—								
January...	159	204	156	310	162	225	136	181
April.....	159	204	156	311	163	224	136	181
July.....	159	204	156	321	169	225	135	180
October....	159	204	146	321	166	225	135	179
1946—								
January...	155	204	146	314	168	218	135	174
April.....	152	204	146	304	163	213	134	174
July.....	152	199	130	308	167	214	134	176
October....	153	199	131	319	163	215	134	177
1947—								
January...	157	190	131	322	167	216	134	181

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

- Ploughs, planters, seed-drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, shares, land sides, mouldboards, mowers, knives, pitmans, guards.
- Superphosphate, ammonium sulphate, muriate of potash.
- Petrol, power paraffin, crude oil, grease, lubricating oil.
- Woolpacks, grain bags, sail twine, binder twine.
- Mealies, oats, lucerne, groundnut oil-cake meal, bonemeal, salt.
- Fencing wire, standards, baling wire.
- Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.
- Corrugated iron, deals, cement, lime, flooring boards.
- Preliminary.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (s).		
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban
1938-39.....	s. d. 1 8	s. d. 2 3	s. d. 2 0	s. d. 2 4	s. d. 1 9	s. d. 1 2	s. d. 3 8	s. d. 2 6	s. d. 6 1
1940-41.....	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42.....	2 7	3 10	2 6	3 11	3 8	3 4	8 5	8 11	17 2
1942-43.....	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1943-44.....	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944-45.....	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1945-46.....	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1946—									
January.....	1 10	0 11	2 4	4 3	1 9	6 7	7 7	3 1	10 2
February.....	1 7	3 4	2 3	5 5	6 9	7 4	7 8	6 11	19 1
March.....	2 3	4 11	2 6	7 7	12 0	6 7	9 5	6 3	25 4
April.....	1 11	2 8	1 10	4 4	6 6	4 0	8 6	13 9	19 6
May.....	3 3	5 3	2 3	5 9	9 11	3 1	9 5	8 7	21 6
June.....	4 8	4 2	5 0	4 9	7 9	3 8	10 0	10 10	13 9
July.....	9 10	7 10	5 10	8 2	11 7	8 8	10 1	16 4	20 11
August.....	7 4	6 4	6 10	5 8	7 10	5 5	13 4	17 11	12 11
September.....	3 1	5 9	4 1	2 8	4 1	2 4	7 5	12 8	16 8
October.....	3 8	5 4	4 9	4 4	3 6	7 7	9 6	9 10	20 11
November.....	1 6	3 4	2 4	9 0	4 0	9 4	9 8	8 8	16 4
December.....	2 4	2 3	2 8	12 1	—	12 5	10 9	7 10	13 10
1946—									
January.....	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February.....	1 11	—	2 3	6 5	—	6 4	7 3	7 11	14 1
March.....	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.....	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May.....	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June.....	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July.....	3 2	1 11	2 2	2 7	3 6	3 4	3 3	4 8	7 10
August.....	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.....	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December.....	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January.....	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5

(s) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Average Prices of Lucerne, Tef, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johannesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (a).		
	Cape.	Trans- vaal.			K1.	K2.	Speckled Sugar.	Cow- peas.	Kid- ney.
1938-39.....	s. d. 3 10	s. d. 3 1	s. d. 4 0	s. d. 2 7	s. d. 13 1	s. d. 12 9	s. d. 25 0	s. d. 16 9	s. d. 24 2
1939-40.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.....	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.....	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.....	6 4	5 4	7 2	4 9	18 8	18 8	53 7	39 6	70 6
1946—									
January.....	7 6	—	8 1	5 9	20 6	20 6	108 4	68 6	75 4
February.....	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 8	69 4
March.....	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 8
May.....	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June.....	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	—	3 11	40 10	40 10	61 4	35 3	59 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	70 2	38 6	52 11
1947—									
January.....	5 10	5 11	—	3 8	38 9	48 9	61 4	38 11	51 4

(a) Municipal Market.

(b) Seasonal year for kaffircorn,
1 June-31 May.

Dry Beans, 1 April-31 March;

Lucerne and teff, 1 July-30
June.

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Native Schools on European Farms.

ONE of the reasons for the migration of natives from European farms is probably the natural desire of native parents to live within easy reach of schooling facilities for their children.

Farmers who have established Native Schools on their land have usually found that this has resulted in a more stable and contented labour supply.

The following regulations have recently been promulgated:—

“ For the establishment of primary schools on European farms, grants not exceeding £150 per school may be paid to assist in their erection and equipment, subject to the following conditions:

- (i) that the applicant or applicants enter into a bond to carry on the school to the satisfaction of the Director of Education for ten years from the date on which the grant is made, and, in the event of the school being closed before the expiry of this period to repay to the Provincial Administration 10 per cent. of the amount of the original building and equipment grant for each unexpired year or part of a year of the agreed ten years—the amount thus surrendered may be wholly or in part paid in school furniture, the valuation of which shall be decided by the Provincial Administration;
- (ii) that the building be erected of material, and according to a plan, approved by the Director of Education, and that it be completed to his satisfaction before the grant is made, provided that the Administrator may, under special circumstances, modify this condition by authorising payments of the grant in instalments while the building is in progress;
- (iii) that the farmer shall include in the bond: (a) ground of suitable type and size for a school garden;
(b) suitable accommodation and gardening ground for the teachers;
- (iv) that the building shall be used only for school purposes and for purposes related to the school.

The Education Department will pay teachers' salaries according to existing scales.

Farmers wishing to take advantage of this offer, should make application with as little delay as possible to:—

The Chief Inspector of Native Education,
Box 380,

PIETERMARITZBURG.

Each applicant is asked to state clearly:—

- (a) his name and address;
- (b) his magisterial district;
- (c) the estimated number of Native children who will attend the school;
- (d) the approximate distance between his farm and the nearest existing Native School.

FARMING IN SOUTH AFRICA

Vol. 22

APRIL 1947

No. 253

Editorial:

Wheat Growing.

THE prevailing high price for wheat in South Africa is frequently the subject of criticism by consumers, and arguments have been advanced for the removal of the protective tariff on imported wheat, and even for the abandonment of wheat growing in this country.

Taking the long view, however, the wheat commission of 1939 recommended that South Africa should be self-sufficient as regards wheat to a certain extent, and this recommendation was justified during the war years. During this critical period, with an abnormally large population and increased demand for bread, South African farmers produced not all, but a great part, of the wheat that was required, and, although at times the bread position appeared to be critical, South Africa never had to do without bread.

In the course of the war the price of wheat rose, as various articles required for its production became scarce and more expensive. Less fertilizer was available; the labour supply was reduced; and tractors and machinery wore out, but had to be kept going by constant repair, as very few replacements were available. But throughout this period it was the policy of the Department of Agriculture, and also of the Wheat Control Board, to maintain wheat prices at an economically sound level and to prevent them from soaring to such levels as would induce inflation of land values.

Each year the estimated costs of production per bag of wheat are carefully worked out, being based on the production costs of the south-western Cape Province—the main and most stable producing area of the country. To this figure is added a reasonable sum to cover interest on land and operator's earnings, and the total is the figure at which the price of wheat is set. Last year, at a time of acute world wheat shortage and a lack of wheat reserves in this country, it was deemed wise to encourage wheat growers to exert a maximum effort to produce wheat by offering an additional inducement in the wheat price. At no time, however, has the price been such as to permit of great profits for the farmer, and the price of bread has been kept at a low figure for the consumers by means of a Government subsidy.

But now, at the end of the war, the price of wheat is still high, and all parties concerned—the Government, the Department of Agriculture, the consumer and the producer—want to see it reduced to a more healthy level.

This reduction can be brought about in two ways, namely, by reducing the cost of production, and by increasing the yield per morgen.

The chief factors which contribute to the production costs are labour, traction and machinery, fertilizers, seed and bags.

For various reasons the supply of farm labour has diminished, in consequence of which farm wages have risen, and at the same time the efficiency of the labour has weakened. One direct result of the labour position is that wheat farmers have been forced to mechanize their farms to a large extent. The prices of tractors and the various machines and implements required on a wheat farm have soared, partly because of increased costs in their manufacture, and partly because of scarcity due to limited shipping accommodation. Fertilizers have been in short supply largely due to the lack of shipping space, and are expensive. The cost factor of seed is dependent upon the price of commercial wheat and has risen in price as the market price of wheat was raised. The bag position has never been easy and prices have risen. Now the position is exceedingly difficult and future prices are uncertain but will undoubtedly be high.

From this review of the cost factors in wheat production it is evident that there is uncertainty in future trends for certain items such as labour and bags, but that for other important items a reduction in cost is to be expected as world trade returns to normality, and shipping facilities become easier. The peak period of production costs has probably been reached, and from now on a gradual reduction in costs is to be expected, and with this a readjustment of prices as the costs decline.

A still more important factor which must be considered in connection with the lowering of wheat prices is that of the yield of wheat per morgen, for, whatever the cost of production per morgen may be, the higher the yield per morgen, the lower can be the price of wheat with the same profit for the farmer. But high yields cannot be obtained by a continuation of the systems which of necessity have had to be followed during the critical past few years in order to ensure sufficient bread.

The time for readjustment has come, and we must direct our efforts to efficient wheat production. This means that in areas which are sub-marginal for wheat, commercial wheat growing must stop. In marginal areas, only the most suitable soils must be sown. The extensive production of wheat under dry-land farming in the summer-rainfall areas which, favoured by Nature in the past few critical years, have stood this country in good stead, must be recognized as an unsound agricultural proposition because of the uncertain moisture conditions. Such a gamble with Nature does not make for efficiency in production, and over a large section of this area the land can be more effectively utilized in the production of wheat or other plants for winter grazing for the livestock.

Under irrigation, wheat growing is a stable proposition as it is not subject to the vagaries of an uncertain rainfall. There wheat growing has a proper place, but for the best results and the highest efficiency the crop must be produced under cropping systems which will maintain the soil's fertility and also ensure high yields.

In the south-western Cape Province where climatic conditions are sufficiently favourable to make this area the main wheat region of the Union, considerable reorganization of the farming systems must be made. On the thin sandy soils of the Sandveld rye must be grown, not wheat. In the main grain areas very shallow soils should not be cultivated as they are seldom economic. Likewise,

Does Small-Farm Dairying Pay ?

A Milk-Production Unit Experiment at the Vaalhartz Agricultural Research Station.

W. A. Verbeek, Animal Husbandry Research Officer, Vaalhartz.

SINCE 1938 experimental work has been conducted with various classes of farm animals at the Vaalhartz Agricultural Research Station. The aim has been to develop, under irrigation conditions, stock-farming systems capable of being successfully applied on this irrigation scheme in order to ensure a stable income for the settlers. Dairy farming is receiving special attention, and the experiments carried out in this connection have yielded very favourable and encouraging results. On the basis of information collected over a



Cows on Sudan-grass pasture 15 inches high.

number of years in crop and milk-production experiments under intensive irrigation conditions, a full-scale dairy farming project was initiated at this research station in 1943 with 30 Friesland cows and one bull on 24 morgen of irrigation land. This project is called the milk-production unit experiment, and its object is:

- (1) To develop an efficient and remunerative system of dairy farming under intensive irrigation conditions, without veld grazing;

- (2) to determine what possible income can be expected from this farming-system under Vaalhartz conditions; and

- (3) to apply the results of research with dairy cows and crops conducted elsewhere at this institution, in actual practice, with a view to the more accurate determination of the problems involved in this form of farming.

The decision to use 24 morgen of land for this experiment is based on the fact that most plots at the Vaalhartz Settlement are 30 morgen in extent. Using 24 morgen for milk-production purposes, leaves a few morgen for the house and other buildings, kraals,

camps, a vegetable garden and fruit trees, as well as space for the cultivation of other crops like wheat, potatoes and feed for draught-animals, i.e. 6 morgen in all. Since veld grazing on this settlement is limited and most settlers have difficulty in obtaining it, no veld grazing is made available to the animals in this unit experiment.

The 24 morgen of irrigation land are used exclusively for the production of fodder and pasture crops for the herd, and a six-year rotational cropping system is followed with lucerne, winter cereals and Sudan grass or babala, details of which are given in the following table.

Rotational Cropping System with 6 camps of 4 morgen each.

Season.	Camp 1.	Camp 2.	Camp 3.	Camp 4.	Camp 5.	Camp 6.
1943— Summer.....	Lucerne	Summer grass	Lucerne	Lucerne	Lucerne	Summer grass (S).
1944— Winter.....	Lucerne	Winter cereal	Winter cereal	Lucerne	Lucerne	Lucerne
Summer.....	Lucerne	Summer grass	Summer grass	Lucerne	Lucerne	Lucerne
1945— Winter.....	Lucerne	Lucerne	Winter cereal	Winter cereal	Lucerne	Lucerne
Summer.....	Lucerne	Lucerne	Summer grass	Summer grass	Lucerne	Lucerne
1946— Winter.....	Winter cereal	Lucerne	Lucerne	Winter cereal	Lucerne	Lucerne
Summer.....	Summer grass	Lucerne	Lucerne	Summer grass	Lucerne	Lucerne
1947— Winter.....	Winter cereal	Lucerne	Lucerne	Lucerne	Winter cereal	Lucerne
Summer.....	Summer grass	Lucerne	Lucerne	Lucerne	Summer cereal	Lucerne
1948— Winter.....	Lucerne	Lucerne	Lucerne	Lucerne	Winter grass	Winter cereal
Summer.....	Lucerne	Lucerne	Lucerne	Lucerne	Summer grass	Summer grass
1949— Winter.....	Lucerne	Winter cereal	Lucerne	Lucerne	Lucerne	Winter cereal
Summer.....	Lucerne	Summer grass	Lucerne	Lucerne	Lucerne	Summer grass

The winter-cereal grazing consists of oats and barley and the summer grazing of Sudan grass and babala.

The Rotational Cropping System.

The area under lucerne is 16 morgen in extent; 8 morgen are put to oats and barley in winter and to Sudan grass or babala during the summer period. The lucerne remains for four years, at the close of which it is ploughed in and followed for two successive years by winter cereals and Sudan grass or babala during summer, after which the area is again put to lucerne. In a definite rotation, four morgen of lucerne are ploughed up annually, while four morgen which have been under Sudan grass or babala, are sown to lucerne again. The lucerne is established during April, with an application of approximately 20 tons of kraal manure, 1,000 lb. of superphosphate and 200 lb. of sodium nitrate per morgen. It also receives an annual

DOES SMALL-FARM DAIRYING PAY?

top-dressing of 800 lb. of superphosphate per morgen during August. The kraal manure is obtained from the cows in the unit proof. The oats and barley are sown during March and April with an application of 600 lb. of superphosphate and 300 lb. of sodium nitrate per morgen, except when the crop succeeds lucerne, in which case only 600 lb. superphosphate per morgen are applied. Algerian oats and Victoria barley are sown. The oats and barley are ploughed in from the beginning of September to the middle of October, according to the decline in growth, and replaced by Sudan grass and babala, sown from the end of September and on into November, 800 lb. of superphosphate and 400 lb. of sodium nitrate per morgen being applied at the time of sowing. The following quantities of seed are used per morgen: Lucerne, 40 lb.; Sudan grass and babala, 60 lb. each; oats and barley, 150 lb. each.



Cows grazing on babala 12 inches high.

The lucerne is cut mainly for hay and fed to the herd in this experiment. The surplus lucerne hay, carried over at the end of each year, is sold. When circumstances do not permit of the making of lucerne hay, the crop is ensiled with 3 per cent. molasses. This lucerne silage is fed during seasons when no summer or winter grazing is available. The lucerne is not grazed, the danger of hoven being too great.

The stubble or residue which is usually wasted on the land after the lucerne has been cut and the hay removed, is, however, grazed for 2 to 3 days after each cutting, when there is no danger of hoven.

The oats, barley, Sudan grass and babala are used exclusively as grazing.

Treatment of Dairy Cows.

Good quality cows are kept in this experiment since the feeds and pastures produced are too valuable and expensive to be fed to animals of inferior quality. Because no veld grazing is available, no calves are reared, and suitable cows or heifers are bought to replace old cows, cows that die, low producers and unproductive cows. Calves born in the herd are sold before they are a week old, as is done in large dairying concerns in and near urban areas. When not

grazing or being milked, the cows are kept in two camps (provided with adequate tree shelter) near the milking shed. Cows in milk are kept apart in one camp, and dry cows in calf and the bull in another. In these camps the cattle receive their lucerne hay and silage in hay-racks with mangers, which reduce wastage to a minimum. Water and a salt-and-bonemeal lick are also provided here. As far as possible, the cows are milked for 300 days and served again about two months after calving. Young cows are served about 3 months after calving, in order to give them more time to improve in condition before the next lactation commences. The cows are milked twice a day and at milking time the high producers receive supplementary mealie meal feed in the byre. This mealie meal is bought, no maize being produced under this system as yet. The surplus lucerne hay is virtually exchanged for mealie meal.

Grazing of Crops.

The oats, barley, Sudan grass and babala are, as far as possible, all grazed in the early stages of growth, i.e. when they have reached the height of 9 to 12 inches. In these stages the nutritive value is at its peak, especially for milk-production, and recovery of the plant much more rapid. These pastures are controlled and the amount supplied to the cows restricted in order to ensure that suitable young grazing will always be available during the season. The area under pastures is divided into morgen camps by means of electrical or other temporary fencing and each camp is cropped down within a period of 7 days, after which it is rested to recover for the next grazing period. Continuous grazing of summer and winter pastures has a most detrimental effect on the growth of plants. Considerably more grazing of higher quality is obtained through this system of rotational grazing.

High-producing cows always receive preference on pastures. Dry cows in calf receive grazing only when the needs of the producing cows have been provided for. Shortly after sowing and again at the end of the season when grazing is still scarce, only the high producers are allowed on the pastures, and only for about an hour per day. As more grazing becomes available, the high-producing cows are kept on grazing for longer periods per day and the other cows in milk and later also the dry, pregnant cows are gradually allowed on pastures. The dry, pregnant cows are usually put on pastures which have first been lightly grazed by the cows in milk; this gives the latter the benefit of the best grazing, the residue being sufficient for the dry pregnant cows. The crops used in this system make valuable pastures, on which cows can maintain a high level of milk-production with the lucerne supplement they receive. It is, consequently, of primary importance for the success of the farming system that the pastures be used as effectively and economically as possible, especially the winter cereals which cannot make such rapid growth as the summer pasture crops.

Hay Ration.

Cows in milk are taken to the pastures immediately after milking in the morning, and on returning they are given lucerne hay in the camp racks. The quantity of lucerne hay fed, varies according to the amount of grazing available. When grazing is scarce and the cows are allowed to graze for only one hour per day, they receive an average of 25 to 30 lb. of lucerne hay per cow per day. In the case



Cows on barley pasture.



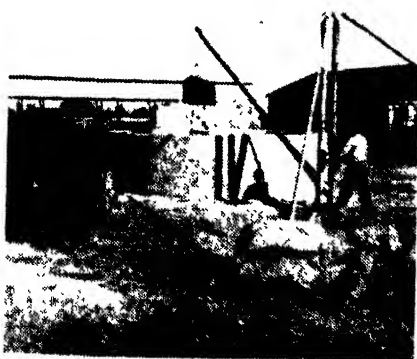
Cows grazing on oats.



Cows on fine stand of young oats.



Sudan grass in young growth stage being grazed for the fourth time.

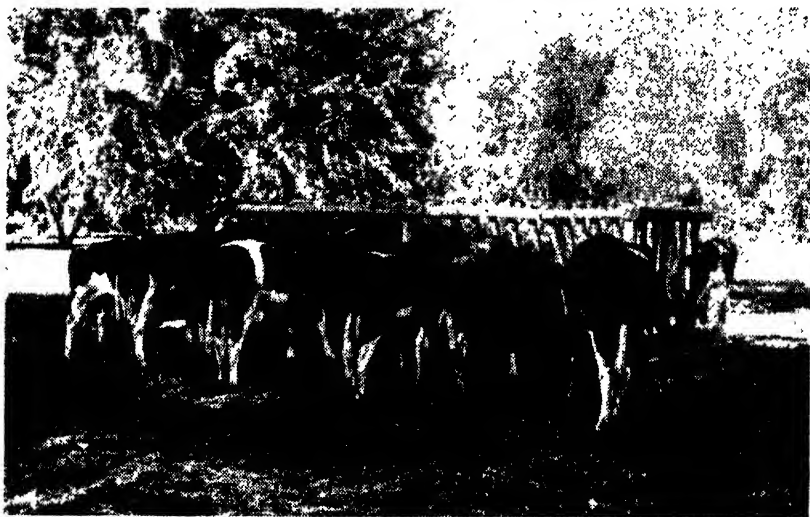


Unchopped lucerne silage being hoisted from the pit silo and loaded on to a wagon.



Bull and dry cows at hayrack.

of cows grazing for 4 hours per day, the average allowance is 18 to 20 lb. lucerne per cow per day. On 8 hours of grazing per day, the cows receive an average of 15 lb. of lucerne hay per cow per day. In addition to lucerne hay, cows yielding 4 gallons of milk per day and more, receive supplementary mealie meal, according to their excess production. Dry, pregnant cows receive less lucerne hay than the cows in milk, viz. an average of 10 lb. of hay per day when they



Cows in milk at the hayrack.

are on pastures. During the period of transition from winter to summer and again from summer to winter, i.e. from the time when the pastures begin to fail in growth and nutritive value till the next pasture crops are ready for grazing, only lucerne hay or lucerne hay and lucerne silage are provided, if the latter is available. Cows in milk then receive an average of 35 lb. of lucerne hay or 25 to 30 lb. of lucerne hay plus 30 lb. of lucerne silage per cow per day; cows producing more than 3 gallons of milk per day receive a supplementary ration of mealie meal according to their production. Dry, pregnant cows receive an average of 20 to 25 lb. of lucerne hay per cow per day when they are not on grazing.

Sowing Time for Crops.

The transition period is usually of short duration, since the sowing programme is drawn up with a view to making the interruption of grazing as brief as possible. Sudan grass or babala, which is sown during the last week of September or during October, may be grazed after about 46 days, i.e. from the middle of November onwards. Oats, sown during April—May, will yield grazing till October, thus reducing the break to about 1½ months during which no grazing is available at this time of the year. The period of transition from summer to winter is of about the same duration, since oats sown during March will be ready for grazing from the beginning of May, while Sudan grass or babala yields grazing till the end of March. During 1946, for instance, oats and barley were sown on 8 April, 1946 (after the lucerne had been ploughed in) and then grazed

DOES SMALL-FARM DAIRYING PAY?

from 24 and 26 May, 1946, i.e. 47 and 49 days respectively after the date of sowing. The barley was grazed until 30 September after which it was ploughed in, the soil being sown to Sudan grass and babala on 30 September, 1946, these crops in turn being grazed from 14 November, 1946. The oats produced good grazing till 25 October, 1946, when it was ploughed in and succeeded by Sudan grass and babala.

Results Obtained.

This milk-production unit experiment which has been in operation for 3 years, has already produced valuable results and shows that dairy farming can be a paying proposition under intensive irrigation conditions. The results obtained during the second and third years of this experiment, extending from 1 September, 1944, to 31 August, 1946, are briefly given below:—

A.—MILK PRODUCTION.

	<i>Second Year.</i>	<i>Third Year.</i>
Experiment period (365 days).....	1/9/44 to 31/8/45	1/9/45 to 31/8/46
Average number of cows in herd during year.....	29.99	29.8
Average number of cows in milk during year.....	72.5	72.5
Average number of cows in milk during year.....	21.7	22.8
Total milk-production.....	184,303 lb.	200,887 lb.
Average milk-production per day.....	50.5 lb.	55.0 lb.
Average daily milk-production per cow in herd.....	16.8 lb.	18.5 lb.
Average daily milk-production per cow in milk.....	23.0 lb.	24.0 lb.
Number of calves born—		
Heifers.....	15	14
Bulls.....	13	13

One cow died during the second year, and three during the third.

B.—FODDER PRODUCTION.

Average amount of lucerne hay surplus per year.....	14 tons
Seed and fertilizer used per year:—	
Lucerne seed.....	180 lb.
Oats and barley seed.....	1,200 lb.
Sudan grass and babala seed.....	480 lb.
Superphosphate.....	124 bags.
Sodium nitrate.....	22 bags.

The lucerne yield averaged 9 tons per morgen per year. The lucerne receives 8 irrigations per year, and the oats, barley, Sudan grass and babala 4 to 5 per season.

C.—CONSUMPTION OF HERD (COWS AND BULL).

Lucerne hay.....	207,460 lb.	243,250 lb.
Lucerne silage.....	142,730 lb.	67,790 lb.
Concentrates.....	21,841 lb.	14,341 lb.
Bonemeal and salt.....	750 lb.	1,030 lb.
Cow grazing days of—		
One hour per day.....	325	748
Two hours per day.....	880	2,013
Four hours per day.....	2,827	4,607
Eight hours per day.....	2,488	2,164

This experiment is only in its initial stages and it shows improvement as the development of the six-year system of rotational cropping progresses, the quality of the cows improves and the management becomes more efficient. Thus far, increasingly favourable results have been obtained each year, as can be seen from the increased milk-production, the reduced consumption of concentrates and the improved

grazing yields of the third year, as compared with those of the second year of the experiment. The unit experiment can, however, still be improved in many respects. The yield of the lucerne hay is, for instance, very poor and should be considerably higher. A portion of the lucerne is old and has a poor stand, while one morgen is carrying a mixture of lucerne and grasses used in earlier experiments. As soon as the rotational cropping system is in full operation, the yield will improve. The quality of the cows can also be greatly improved, because this unit experiment was commenced with a number of mixed cows, some of which were somewhat indifferent producers.

Further Improvements Proposed.

It is intended to conduct this undertaking as an independent unit in the near future, with its own complete equipment and labour, like agricultural implements, draught animals, native labourers, a European foreman, etc., in order to make the whole farming enterprise correspond to conditions encountered by the farmer. The project, however, remains an experiment and is always subject to adjustments and improvements, as the results of other experiments become available, and more experience is gained.

Since the commencement of the experiment, various improvements have already been effected, e.g. the amount of superphosphate and nitrate applied in the case of winter cereals and Sudan grass and babala has already been increased. Whereas the nitrate was formerly applied as a top-dressing, all of it is now applied at the time of sowing, since it has proved to be a failure as a top-dressing. Where only oats were formerly sown for winter grazing, two morgen are now put to barley, which is valuable as grazing during the cold winter weeks when oats show no growth. The grazing of the residue on lucerne lands after mowing for hay, has prevented waste of valuable fodder and provided plenty of grazing for the cows. Babala is also sown for summer grazing since it has been found to give a slightly higher grazing yield than Sudan grass, and has the same value for dairy cows. The possibility and profitability of rearing a few heifer calves from the best cows each year, is being investigated, since there is often superfluous grazing and surplus feed. Hence, if the rearing of only a few (about 4) heifer calves has to be undertaken each year, this branch may later be incorporated in the undertaking, since cows and heifers of good quality are expensive and difficult to obtain. Furthermore, there is always the danger of introducing disease with bought animals.

Application of this System.

The settler or farmer who wishes to start a dairy-farming concern similar to this milk-production unit experiment, will have to change over *gradually*, since cows of good quality are expensive and difficult to obtain, and suitable buildings are essential. Until such time as the dairy herd can be brought up to full strength, surplus lucerne hay can be sold and the amount of summer and winter grazing reduced accordingly.

The type of dairy farming aimed at in this milk-production unit experiment, is a very stable form of farming. It is, however, very exacting and only those who are keenly interested in dairy farming and command the necessary knowledge, can expect to make a success of the undertaking.

Rye Windbreaks for Vegetable Plots.

E. Strydom, Horticulturist, Vaalhartz Experiment Station,
Division of Horticulture.

IN vegetable-growing areas such as the Cape Flats, parts near Port Elizabeth and at Vaalhartz, where strong winds often occur and the soil is of a sandy nature, it is essential, where vegetables are grown, to make provision for windbreaks.

Wind damage to vegetable crops may occur in different forms, apart from the direct effect of the blowing over and breaking off of plants. Of particular importance in this connection, is the scorching



Rye windbreaks between vegetable plots.

of finer plants such as lettuce, which has an adverse effect, not only on the yield, but also on the quality, as a result of leaf damage. Even more important still, is the problem of establishing the crop on the land. The seedlings of most vegetable varieties are usually so fragile that after germinating they may easily be scorched to death or smothered by sand. Windy weather usually causes the top layer of soil to dry out rapidly, leaving insufficient moisture for the survival of the seedlings. The fine, dry, hot sand is blown around the plants and may ultimately cover them completely. Although various types of windbreaks of straw or reed mats, hedge plants or trees are commonly used, they all have disadvantages as well as advantages. The construction and maintainance of reed-mat hedges, e.g., which would afford complete protection, involve heavy expenses. Beans and hedge plants, again have the disadvantage that their roots take up much valuable ground, may exhaust the soil in their immediate vicinity and have a shading effect.

At Vaalhartz, rye was used very successfully as a windbreak and showed few of the common disadvantages.

Rye Windbreaks at Vaalhartz.

The accompanying photo shows a windbreak consisting of a stand of rye of the Abrussi variety, planted between the vegetable experiment plots in the horticultural section of the Vaalhartz Experiment Station.

This variety was obtained from the Stellenbosch-Elsenburg College of Agriculture and grew very vigorously on the poor, sandy soils at Vaalhartz. The whole piece of land was divided into plots of about 100 ft. by 50 ft. and the rye attained a height of about 5 ft. 9 in., providing an excellent windbreak. Depending on the strength of the wind, the rows may be planted even further apart, since a row of rye takes up about 3 ft. of land on either side by shading and exhausting the soil. Although rye is a winter cereal, it may be used successfully during summer as a protection against the scorching south-east winds. Rye has a strong straw and by preparing the soil in good time for the summer vegetables, the rye windbreaks may be sown during the winter months, even as late as July. By the time the summer vegetables are planted, the rye will already have reached a good height and will afford excellent protection for the young plants. When the rye matures early in summer, the ears may be cut off and the straw left between the vegetable plots to provide a windbreak as long as it is required.

Wheat Growing :—

[Continued from page 336.]

very steep sloping lands, because of their erodibility, should be retired from cultivation and put down to pasture, and the remaining lands must be farmed under improved systems. Provision must be made for the alternate cultivation of soil-building humus-producing crops such as dry-land lucerne with wheat. A fair start has already been made in this direction, but the system must be extended and applied to every land, so that each land in turn may be benefited by the pasture crops. This will not only ensure a better system of mixed farming—an ideal towards which all must strive—but it will also result in high yields of wheat per morgen at relatively low cost. The final objective can be, and must be, higher yields of wheat per morgen, lower costs per bag, lower prices to the consumer and greater profit for the farmer.

(Prof. J. T. R. Sim, Stellenbosch-Elsenburg College of Agriculture.)

Nursery Quarantines.

The following nursery quarantine was in force on 1 April 1947 :—

Municipal Nursery, St. George's Park, Port Elizabeth, on Privets, Bay, Ekebergias and Pecans (all), for red scale.

Pastures of the Southern O.F.S., a Century Ago and To-day.

J. C. de Klerk, College of Agriculture, Glen.

THE passing of the Soil Conservation Act in 1946 was the first step in an extensive and vigorous propaganda campaign aimed at restoring and conserving the natural agricultural resources of South Africa—soil, veld and water. To-day everything possible is being done to draw attention to the deterioration of the veld and the erosion of our lands.

When farmers are asked to give reasons for the deterioration of their stock, they invariably blame the periodic droughts, in other words, the lack of sufficient grazing or water on the farm, and it is for this reason that the State has to-day made it its aim to assist every individual farmer not only to safeguard but also to restore and constantly improve his grazing and water sources against further deterioration.

It would be idle to deny that our South African pastures presented a completely different picture a century ago, and it is, therefore, the object of this article to subject a portion of the pastures of the southern Orange Free State to a close scrutiny in an attempt to ascertain the extent and causes of the changes which have taken place.

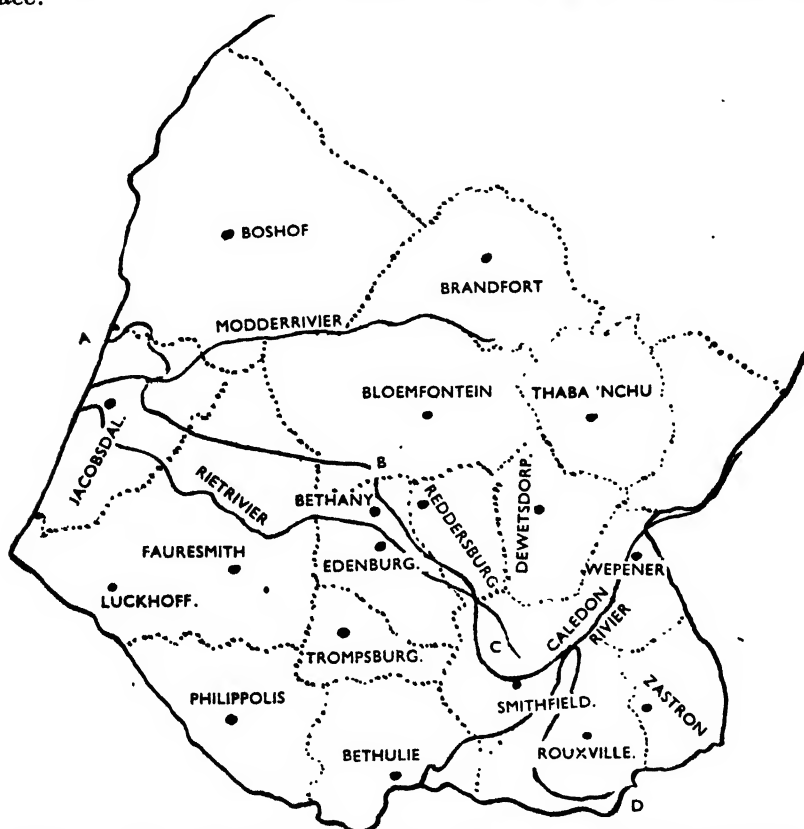


FIG. 1.—Map of southern Orange Free State. Line ABCD indicates the transition stage between grass veld and shrub veld. This transition belt is several miles wide.

Historical Data.

Fortunately we have a considerable amount of information at our disposal in the form of descriptions of conditions in the southern Orange Free State in those days, by travellers like James Backhouse who visited those parts in 1839; Gordon Cummings, a big-game hunter, in 1850; Dr Andrew Smith, director of an exploring party, in 1834; and Zeyher in 1836. In addition to the narratives of these travellers, there is also the testimony of officials and farmers from the Cape Colony who, more than a century ago, visited these parts in times of drought.

In the accompanying map (Fig. 1) the area of transition from grassveld to shrub is indicated by the line ABCD. There is naturally no definite line of demarcation, since one type of veld gradually merges into another. The Riet River area south of Bethany is now regarded as mainly shrub veld, whereas a century ago it was covered with waving grass. The Voortrekker woman, Anna Steenkamp, writes of this area:—"With rejoicing we reached the Riet River. . . We then entered a country, arid and devoid of wood or manure, where the grass grew so tall that we could hardly find the cattle and the children in it" ⁽¹⁾. (Translation). Another visitor to this area was W. C. van Ryneveld, Civil Commissioner of Graaff-Reinet, who visited the Trek-farmers there in 1839. He states that along the Riet River, where the trekkers were located, the grass was luxuriant, and, "as far as the eye could see, the country looked like a land of wheat" ⁽²⁾. (This description could be applicable only to red grass.)

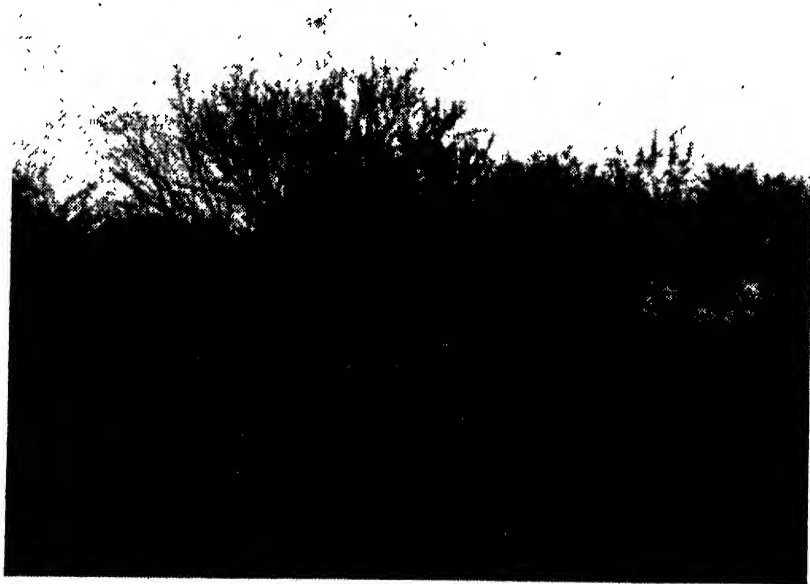


FIG. 2.—Thorn-tree veld such as this formerly occurred on an extensive scale in the south-western O.F.S.

James Backhouse and his party also traversed this area in 1839 on his way back to Philippolis. In his description of the veld in the vicinity of the Bethany Mission Station he says:—"The country continued to be covered with grass, mostly of a 'sour' character

and it was now brown from the cold." On his way from Bethany to Riet River and Randfontein he met a certain farmer by the name of van Wyk, who was out hunting, and " remarked to him that this was a fine grassy country "(3).

On his hunting expeditions, Gordon Cummings travelled from the confluence of the Orange and Vaal Rivers to a spot which he called " the land of the blesboks, which are found together with black wildebeeste and springbok in countless thousands on the vast green plains of short 'sour' grass situated about 150 miles to the eastward of my then position." Cummings reached the Riet River



FIG. 3. Densely covered red-grass veld which has been grazed short by cattle during the recent drought. Note the absence of bare patches.

in due course. North of the river he found soft, open sandy veld with occasional hills, luxuriantly covered with grass. From the Riet River he trekked north-east for a short distance to the western borders of a country " entirely different from any I had hitherto seen ". " The sweet grass which had heretofore been so abundant ", he continues, " became very scarce, being succeeded by a short crisp 'sour' pasturage, which my cattle and horses refused to eat "(4). (This grass was probably "suurpol", *Elyonurus argenteus*.)

On another expedition Cummings also refers to this "sweet grass" south of the Vet River. As he proceeded southwards he found himself " upon the country of sweet grass and entering upon bare and boundless open plains, thinly clad with 'sour' pasturage, the favourite haunt and residence of innumerable herds of black wildebeest, blesbok and springbok." [It must be pointed out here that the climax grass of this region is "wildebeest" grass(5), but since Cummings referred to it as "sweet grass", the only explanation can be that, owing to the vast numbers of antelope grazing on it and the fact that the natives were in the habit of burning the veld, it must have reverted to red grass, which is a transition grass.] If the map (Fig. 1) is now again consulted, it becomes apparent from this and other evidence that the strip of country which to-day constitutes a transition area between grassveld and shrub, was a pure

grassveld area a century ago, probably covered with red grass as the climax grass, and that the line of transition at that time must have been situated much further south. This is borne out by the writings of the above-mentioned and other authors. On his journey between Colesberg and Philippolis, Backhouse states that the country north of the river was much like that on the south side, "but the grass was not quite so scarce," and further towards Bethulie he says that "the grass on the adjacent plain was nearly all eaten up" ⁽³⁾.

Dr. Andrew Smith traversed this same area in September 1834 and he observes that: "The old grass stood rather more abundant and the young blades of a dark green colour began to be seen thinly intermixed with the dry ones. The country still consisted of flats and trap hills. Very few shrubs and only on the hills a few thinly scattered dwarf trees" ⁽⁴⁾.

The Griquas complained to Dr. Smith that the stock of the Trek-farmers from the Colony were eating all their "grass". He says that at Boschjesspruit "on the flats but especially on the hills there was an abundance of dry grass," while in the vicinity of Slikspruit (near Bethulie) "the flats have scarcely a bush upon them and the grass grows in tufts, closely set together." He adds that "there are two sorts of grass occurring—'sour' and 'sweet'; the latter is the most abundant and the former appears longer in consequence of being untouched by the cattle" ⁽⁵⁾.

Even in those days there was veld deterioration, as appears from Dr. Smith's remark that "the sour grass does not get destroyed in the roots so quick as sweet grass—the sweet grass is by the treading of feet killed and is succeeded by small bushes."

A farmer by the name of Kruger, whose farm adjoined the Slikspruit, complained that the stock farmers were not applying any system of veld control and that "if they were to feed their sheep upon the higher and drier parts and let the cattle resort to the moister parts on the farm, the grass would never be destroyed the way it is."

On a subsequent journey from Philippolis to Douglas, Dr Smith remarks that "the country between Philippolis and Bushmanfontein is very dry with a moderate quantity of short grass", and that as he proceeded to Spootfontein there was "very little grass except in the valley through which the water flows."

Causes of Veld Deterioration.

If these and other data are analysed, one can only come to the conclusion that a large section of the southern Orange Free State must have consisted of grassveld and that shrub bush is steadily encroaching northwards.

The factors responsible for this state of affairs must not be sought only in the farming methods practised to-day; they originated in the remote past. Some of these factors may be considered here.—

(a) *Antelopes, Diseases and Pests.*—When the first Europeans entered the Free State, the grazing was by no means in an undamaged condition. Hundreds of thousands of antelope had for years been cropping away the best grasses, with the result that extensive areas of grassveld had become "sour" and unpalatable. For many years the early stock farmers were compelled to herd their animals and to kraal them at night in order to protect them from the numerous beasts of prey like lions, hyenas, wild dogs, etc., with consequent unnecessary trampling of the veld. Locusts were a serious menace, especially in dry years, and at that time there was as yet no concerted and co-ordinated action in Southern Africa to control this pest ⁽⁶⁾, ⁽⁷⁾ and ⁽⁸⁾.

(b) *Periodic severe droughts* like those of 1852, 1862, 1895, 1902, 1906, 1914, 1919, etc., did vast damage to the veld. Wealthy farmers went bankrupt in 1862, and vegetables were sold on the Bloemfontein market at £6 for half a grain-bag full(?). In 1914 even hardy wild olive trees succumbed.

(c) *The Bantu Tribes* had scant respect for the soil and kept large herds, mostly of cattle and, to a smaller extent sheep and goats. In order to obtain good grazing for these animals as well as for the game which they hunted, and also to exterminate snakes and vermin in the tall grass, they burnt the veld annually (³) and(⁹).



FIG. 4.—Trampled out grassveld where steekgras (right) is now predominant. Note the bare patches and the encroachment of inferior shrubs on the left.

The Griquas, who inhabited the area between the Orange and Modder Rivers, kept large numbers of livestock and it is, therefore, obvious that the veld was already heavily burdened when the first Trek-farmers entered this area in 1821.

(d) *Deforestation*.—The Bantu played an important part in the eradication of our indigenous forests. They not only destroyed all trees in the vicinity of their kraals, but were also in the habit of burning the veld, and, therefore, the trees.

This process was later aggravated by the development of the diamond mines. Firewood was required for the boilers, with the result that no tree within a radius of hundreds of miles of Kimberley was safe. The thorn-trees and camelthorn forests south of the Riet River, mentioned by Cummings on his trip eastwards from the confluence of the Orange and Vaal Rivers, vanished like mist before the sun under the stroke of the axe. Wood-prices soared to unprecedented heights, and in Kimberley up to £35 was paid for half a waggonload(⁶).

Plant Succession.

(a) *Red-grass Veld*.—As has already been mentioned, there is ample evidence that the familiar red-grass veld formerly extended much further south, but that it disappeared from large areas

as a result of mismanagement of the veld. This is a very unfortunate circumstance, since red grass is one of our most valuable veld grasses. It is excellent for haymaking purposes and all livestock eat it eagerly as long as there is something to nibble at. Given the opportunity to grow unhampered, it forms a thick mat which very effectively prevents soil erosion. Obviously, that is why the Department of Agriculture is so anxious to-day to re-establish red grass on trampled veld.

With its shallow root system, however, it has no great drought resistance. Moreover, its innovation nodes are situated near the surface and that is why this grass disappears so easily where overgrazing, trampling and veld burning take place. It is particularly



FIG. 5.—Limits of shrub veld a century ago.

sensitive to summer burning. On the other hand, when properly controlled, red grass with its spreading root system easily ousts its xerophytic neighbours* under favourable conditions⁽⁵⁾.

If red grass is abused, however, it is gradually superseded by its xerophytic neighbours (*Eragrotis* "blousaadgras" species) because they all have deep root systems and deep-seated innovation nodes. The *Eragrotis* species are not so easily trampled by stock⁽⁵⁾.

In spring, or as young regrowth after burning, animals readily eat these grasses, but as the plants develop and reach maturity, they become increasingly unpalatable and in autumn and winter they

* That is, plants with high drought resistance.

are practically unfit for grazing. Their hay is not as palatable as that of red grass, and the mown veld is useless as grazing, especially for sheep, for the hard stubble injures the mouths of grazing animals. In this group of grasses we find the well-known "knietjiesgras" which is an important factor in the veld-conservation campaign. It is not only easily propagated from seed, but the culms bend down and take root, thus forming new plants.

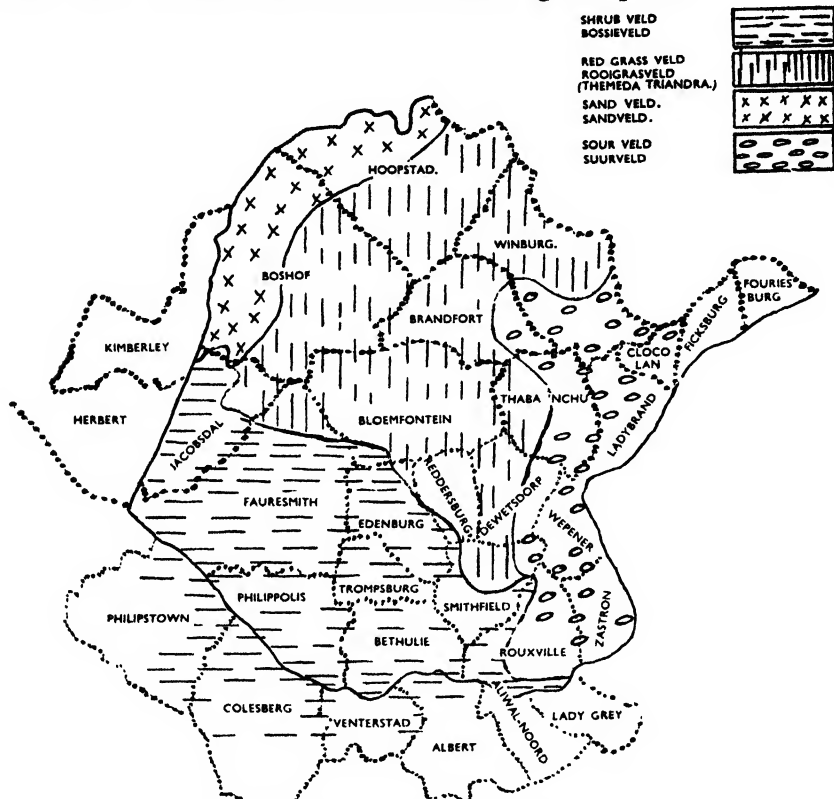


FIG. 6.—Limits of shrub veld to-day.

If *Eragrostis* veld is, however, exposed to overstocking, the plant succession receives a further set-back to the *Aristida* or steekgras stage. These pioneer grasses have very little value as grazing and when the seeds find their way into the wool of merino sheep the animals suffer agonies. The presence of large amounts of seed in the wool also causes considerable financial loss annually on the wool clip.

If this veld is subjected to further trampling, bare patches develop, and the final result is soil erosion with all its attendant evils. Fortunately, if Nature is given the opportunity, it can heal the veld by providing quick grass to cover the bare patches. This quick grass (*Cynodon*) is, however, one of our most inferior grasses in that it is apt to cause geilsiekte when wilted⁽¹⁰⁾.

(b) *Shrub or Karrooveld*.—As has been indicated, no definite line of demarcation can be drawn between grassveld and shrub veld in the south-western Orange Free State, since one type gradually merges into another. With the disappearance of red grass and the

ascendancy of "blousaadgras" and steekgras varieties, however, shrub encroachment comes into prominence. The nutritive value of these bushes, especially during the winter months, and their resistance to drought were well known to the Trek-farmers, who encouraged their development in every possible way. The value of good shrub veld is readily recognized, but from the point of view of soil conservation, the encroachment of this type of veld is dangerous. In contrast to grassveld, shrub veld is open and during heavy downpours the water flows off freely. In other words, soil erosion takes place much more rapidly than where the veld is covered with grass. There is no objection to bushes on level ground where run-off is slow, but on slopes the grass cover must be maintained and encouraged at all costs. Furthermore, the carrying capacity of shrub veld is, of course, lower than that of good grassveld.

In the southern Orange Free State a fair variety of good Karroo bushes is found, like the well-known "kapok" bush, "skaapbos", "kerriebos", blue and white aster, "vyebos", "daggabossie", "perdekaroo", "aarbossie" and also various varieties of "ganna" bush on low-lying ground.

Unfortunately these good bushes are not always able to endure as much as is expected of them. If they are over-grazed, veld deterioration gains a further foothold and bitter-bush becomes predominant, a condition which is already prevalent to-day. Although this plant annually causes considerable stock losses, it is understandable why farmers sometimes try to justify its existence on the grounds that at times the animals eat it readily enough; but in the absence of other food, animals will eat anything to keep alive. It is quite incorrect to refer to bitter-bush veld as Karrooveld, for, although bitter-bush is to be found in trampled areas on true Karrooveld, it has no association with good Karrooveld. Every bitter-bush must be regarded as a sign of veld deterioration.

Summary.

The writer has attempted to indicate briefly the condition of parts of veld in the past, in contrast to the present position. There is every reason to believe that, with judicious veld control, these pastures can be largely restored and their carrying capacity increased. On the other hand, Nature is warning us that what has already taken place in the southern Free State, may also happen in our good grassveld areas in other parts of the country.

[Red grass in this article refers to what farmers commonly call "rooi plat-blaargras" and not to spear grass (swartangelgras) with which "rooigras" is often confused.]

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The Feeding of Farm Animals.

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I. Dairy Cattle.*

IF the feeding of farm animals is to be successful, certain requirements have to be complied with. In the first instance, attention must be paid to the nature and quality of the feeds to be used in the mixing process, after which the rations must be made up to comply with the nutritional requirements of the animals to be fed.

Main Requirements to which Rations must Conform.

1. *Suitability of feeds.*—The feeds used in making up rations, or fed as such to the animals, must be of a quality not likely to have any injurious effect on either the animal or its final product such as milk, meat, eggs, etc. In this connection farmers are reminded especially of weeds, such as Khakibush in teff and hay, and of impurities such as sand and dust in concentrates, and in the byproducts of mills. In addition, feeds must be utilized in such a manner that they will not taint the final animal product. In this connection one thinks of the effect of too much fish meal in fowl rations, which makes eggs practically unfit for use owing to their unpleasant flavour. Certain types of clover affect the flavour and odour of milk.

Feeds which may be effectively utilized by certain types of livestock, are often unsuitable or even harmful to others. Cotton-seed meal is a good feed for cattle, although it is poisonous to pigs if it constitutes more than 10 per cent. of the concentrate ration.

Furthermore, the efficacy of many types of feed depends on the proportions and combination in which they are mixed with other feeds. An effective concentrate ration is obtained by mixing feeds of various origin. The proteins, for example, which are derived from leguminous crops, must be mixed with concentrates derived from cereals. Vegetable proteins, on the other hand, must be mixed with animal proteins.

(2) *Bulkiness of the ration.*—Bulkiness in a ration is a requirement which must not be overlooked, and which varies for every class of livestock. Cattle, horses and sheep utilize coarse feeds very effectively, consequently a considerable amount of bulkiness must be supplied in their rations to enable their digestive systems to function properly and to keep them in a good state of health. Pigs and poultry are poor digesters of crude fibre and their digestive systems may easily be upset if their rations are too bulky.

In general, hard working or high-producing animals should receive a larger proportion of concentrates in their rations, and consequently the bulkiness decreases proportionately.

(3) *Palatability.*—If rations are unpalatable, animals usually eat less of it, and such rations are usually also poorly digested. In fact, when rations are unpalatable, it is almost impossible to induce fattening animals or high-producing dairy cows to eat sufficient for their needs. Flavour is only one of the factors which determines the palatability of food. This factor is often exploited

* The feeding of slaughter cattle and pigs will be dealt with in subsequent editions.

when making up commercial rations. Aniseed, for example, is added to the mixture to encourage animals to eat more of an otherwise unpalatable ration.

Odour also plays an important rôle in determining whether or not a ration is palatable. Some animal proteins, such as fish meal, blood meal or meat meal, often have an unpleasant odour; consequently animals may refuse to eat rations which contain a fair proportion of these animal proteins. To accustom animals to the odour of these constituents, the amounts included in the rations must be increased very gradually.

Coarseness, fineness, dustiness, dryness and moistness are physical properties which all influence the palatability of rations.

(4) *Variety*.—A variety of feeds included in a ration also adds to its palatability and promotes the biological value or assimilability of proteins in the ration. It also ensures the ration against a shortage of nutrients such as amino acids, minerals or even vitamins.

Special care must be taken that the protein constituents of the ration are derived from different sources, e.g. from legumes, cereals and also animals (fish meal, blood meal, etc.).

Proteins are the principal constituents of the vital organs and soft tissues of the animals' body. For this reason it is absolutely essential to ensure that animals receive sufficient quantities of proteins in their ration throughout life.

The term protein is very comprehensive and includes a group of closely related yet chemically distinct combinations. Vegetable proteins differ from each other, and as a group again differ from animal proteins.

Each protein consists of a number of different amino acids combined to form a compound protein molecule.

It has been ascertained that vegetable and animal proteins consist of at least 23 amino acids, the main difference between proteins being the nature and number of the various amino acids present. Amino acids are the final products of protein digestion and the building stones from which the body proteins are formed. Amino acids therefore constitute the central point on which the whole study of protein feeding pivots.

The various feeds must therefore be selected in such a way that the nutrient deficiencies of some are supplemented by the presence of others. In this manner cereals can supplement the deficiency occurring in legumes and vice versa. Cotton-seed meal and groundnut oilcake contain practically the same amino acids and are therefore unable to supplement each other. Consequently only one of these is used in a ration, not both. Animal proteins contain amino acids which are either present in small quantities or entirely lacking in vegetable proteins; consequently it is desirable to supplement the shortage of amino acids in vegetable proteins by the addition of animal proteins.

As a rule animal proteins are particularly rich in the four essential amino acids, viz., tryptophane, lysine, cystine and histidine, which usually occur in very limited quantities in vegetable proteins.

(5) *Fat content*.—Although the feeding standards do not as a rule mention the quantity of fat which should be present in a well-balanced ration, recent research has revealed a few important facts in connection with this nutrient.

Fats with a low melting point, such as soybean oil, must be limited to a minimum in pig rations, since feeds containing soft fats and oils are inclined to form soft fat in the carcase. These types of

THE FEEDING OF FARM ANIMALS.

feed may be utilized effectively, however, in the feeding of dairy cows. Rations for dairy cows must provide sufficient fat for the partial replacement of that lost in milk production. From 3½ to 4 per cent. is needed, and for this reason it is necessary to include vegetable feeds such as oilcakes or linseed meal in the concentrate ration.

(6) *Balance of nutrients.*—Rations for all classes of livestock should contain the essential ingredients, such as carbohydrates, proteins, fats and minerals, in the correct proportions.

(7) *Costs.*—In mixing and buying concentrates, attention must necessarily be paid to the cost of the ingredients. The cost of a ration is not the only basis, however, on which to determine whether it is economical or not. Feeds vary considerably as regards their digestibility, and therefore the cost per unit of digestible or metabolizable nutrients in the feed must be the dominating factor rather than the cost per unit of the feed as such.

Description of Feeds.

(1) *Basic concentrates.*—In this country concentrates with a low protein content, such as maize, oats, wheat, barley, etc., should form the basis of concentrate rations, since these feeds are reasonably plentiful and cheap in normal times. They should be mixed with the supplementary protein-rich concentrates in order to give a balanced concentrate ration. It may generally be said that any type of cereal or cereal byproduct of the milling process, containing from 8 to 12 per cent. of protein, is a basic concentrate, provided it does not contain too much roughage.

Basic concentrates should constitute approximately 60 per cent. of a balanced concentrate ration.

(2) *Supplementary feed.*—In order to balance the basic concentrate ration with a view to meeting the feed requirements of, e.g. dairy cows, pigs and poultry, special feeds which will supplement deficiencies of proteins, minerals and possibly vitamins in the basic ration must be added.

(a) *Protein supplementary feed.*—Feeds or mixtures with a high protein content, usually at least 15 per cent., are used to supplement the basic ration as regards protein requirements. Protein-rich concentrates of vegetable origin, which are commonly used for this purpose include groundnut oilcake, linseed meal, cotton-seed meal, maize germ meal, etc. The latter will usually constitute 10 to 30 per cent. of the meal ration.

Feeding good-quality crops such as lucerne hay, cowpea hay, soyabean hay, etc., can effect a saving in the use of protein-rich concentrates.

Animal proteins, such as fish meal, blood meal and meat meal, are often used to supplement the protein content of basic concentrate rations. These feeds usually constitute 2 to 10 per cent. of the meal ration of farm animals.

(b) *Mineral supplementary feeds.*—Minerals should always be added to concentrate rations, and the nature and quantity depend on the ration and the type of animal to be fed. In the case of dairy cows, bonemeal, salt and, occasionally, ground limestone may be added. It is particularly important to add 1 to 2 per cent. of common salt to the rations of dairy cows.

The amount of minerals included in concentrate mixtures usually varies from 2 to 5 per cent.

(c) *Vitamin supplementary feeds.*—In the feeding of pigs, small quantities of codliver oil are sometimes added to concentrate rations to increase its vitamin A and D content. Half a teaspoon of vitaminized oil is sufficient for a pig for 2 days. It is not desirable to vitaminize large supplies of feed with oil, since most vitamin-rich substances lose their vitamin content after having been exposed to air and light for a short period.

It must be emphasized, however, that if a ration is properly balanced it is not likely that there will be a vitamin shortage. If farm animals have access to green feed, there is practically no possibility of their suffering from any vitamin deficiency.

Practical Application of the above Hints.

A. Cows in Milk.

(1) In making up concentrate rations for dairy cows, due allowance must be made for bulkiness by mixing heavy feeds, such as mealie meal or groundnut oilcake with light feeds such as wheaten bran. The weight of the concentrate mixture should be approximately 1 lb. per quart measure, or 16 lb. per paraffin tin.

(2) The necessary variety must be introduced if possible, by mixing 5 or more feeds from different sources. In order to increase digestibility, at least two of the constituents should have a laxative effect. Wheaten bran and linseed meal are suitable for this purpose.

(3) The amount of crude fibre in the concentrate ration for dairy cows, should not exceed 10 to 12 per cent. For this reason it is not advisable to add large quantities of maize and cob meal to a concentrate ration for dairy cows. Small quantities, however, often have a beneficial effect on the digestibility of concentrate rations.

(4) If the fat content of a concentrate mixture is too low, the ration will, as a rule, be low in digestibility. It is advisable, therefore, to keep the fat content of the ration high enough by adding oilcake, such as groundnut oilcake, or sufficient quantities of certain leguminous seeds, such as soybeans, velvet beans, etc.

B. Rules for the Feeding of Dairy Cows.*

In feeding concentrate rations, made up as indicated above, to dairy cows, the following rules must be observed:

(a) *Roughage requirements.*—Dry roughage, such as lucerne hay, teff hay and other types of hay, should, to a large extent, meet the maintenance requirements of cows. Cows should receive approximately 2½ lb. of hay for every 100 lb. live weight.

Half of the cow's dry roughage ration can be replaced by succulent roughages on the following basis, viz., 3 lb. of silage or 5 lb. of mangels to replace 1 lb. of dry hay.

(b) *Concentrate feeding.*—Cows on green grazing, such as oats or lucerne, can produce large quantities of milk without receiving any concentrates. In many cases cows produce 3 to 4 gallons of

* A fuller description of the scientific basis on which rations are calculated will be included with a reprint of this article.

milk per day from artificial grazing without the addition of concentrates.

Producing cows which have no access to green grazing, should receive a certain amount of concentrates additional to the roughage allowance. Cows with a butterfat test not exceeding 4 per cent. (Frieslands, Shorthorns and Ayrshires) should not receive any concentrates if their production is less than $1\frac{1}{2}$ gallons per day; for higher production they should receive 3 lb. of concentrates for every gallon of milk produced. If the butterfat tests of cow's milk exceeds 4.5 to 5 per cent. (e.g. Jerseys and Guernseys) they receive no concentrates for the first gallon of milk; higher producers, however, receive 4 lb. of concentrates for every gallon of milk produced.

According to the feed requirements of milch cows, as prescribed by various research workers, it is clear that the composition and quality of a concentrate is determined by the nature and quality of the available roughage.

TABLE 1.—*Feed Requirements of Dairy Cows.*

Daily requirements per animal.

Weight of Cow.	Dry material (2 to 2½ per cent. of body- weight.)	Digestible Protein.	OR Crude Protein.	Total digestible nutrients.	Calcium (Ca).	Phos- phorus (P).
(a) FOR MAINTENANCE.						
lb.	lb.	lb.	lb.	lb.	oz.	oz.
700.....	18	0.48	0.56	6.0	$\frac{1}{4}$	$\frac{1}{4}$
1,000.....	25	0.65	0.85	8.0	$\frac{1}{2}$	$\frac{1}{2}$
1,200.....	30	0.75	1.00	9.5	$\frac{3}{4}$	$\frac{3}{4}$
1,400.....	35	0.90	1.20	11.0	1	1
(b) FOR PREGNANCY (last 2 months)						
lb.						
700.....	20-22	0.90	1.20	10	$\frac{1}{2}$	$\frac{1}{2}$
1,000.....	28-30	1.20	1.60	14	1	$\frac{3}{4}$
1,200.....	32-34	1.40	1.90	16	$1\frac{1}{4}$	1
1,400.....	38-40	1.60	2.20	19	$1\frac{1}{2}$	$1\frac{1}{2}$
(c) ADDITIONAL REQUIREMENTS FOR MILK PRODUCTION (per gall. or 10lb. of milk).						
Butterfat percentage of cow.						
3 per cent.....	6	0.40	0.50	2.8	} 4 per cent of the concentrate ration.	
4 per cent.....	$6\frac{1}{2}$	0.50	0.65	3.2		
5 per cent.....	7	0.60	0.75	3.7		
6 per cent.....	8	0.65	0.80	4.2		

Digestible protein content is usually calculated on the basis of 75 to 80 per cent. digestibility of the crude protein in a concentrate ration.

The amount of feed required according to Table I is calculated on the following basis :—

1. A cow requires $2\frac{1}{2}$ to 3 lb. of dry material per 100lb. live weight.

2. A cow weighing 1,000 lb. requires 0.65 lb. of digestible protein (D.P.) for maintenance in order to replace the daily loss of protein from the body, as well as 0.4 lb. to 0.65 lb. of digestible protein per gallon of milk produced (3.0 to 6 per cent butterfat).

Therefore a cow weighing 1,000lb. and producing 3 gallons of milk testing 3 per cent. butterfat, requires (A) 0.65 lb. D.P. for maintenance and (B) gallons of milk. \times D.P., i.e. $3 \times 0.4 = 1.2$ lb. of digestible proteins for milk production.

The D.P. requirements for maintenance and milk production are, therefore, equal to (A) + (B), i.e. $0.65 + 1.2$ lb. D.P. = 1.85 lb. D.P.

3. The total digestible nutrients (T.D.N.) in a ration are calculated on the digestibility of the nutrients in the ration and the amount of fat which they contain. This usually varies in average value from 30 to 50 per cent. in the case of dry roughage to 50 to 80 per cent. in the case of concentrates. It is therefore clear that the amount of total digestible nutrients in the ration will rise as the proportion of concentrates is increased.

4. In some cases, the protein content of a ration is expressed as its nutritive ratio. The nutritive ratio of a ration is the ratio of digestible proteins or protein ingredients to the non-protein ingredients in the ration. The nutritive ratio is expressed as follows:—

$$\text{Nutritive ratio} = \frac{\text{Total digestible nutrients} - \text{digestible protein.}}{\text{Digestible protein.}}$$

The higher the percentage of digestible protein in a ration rises, the narrower the nutritive ratio becomes; or, generally speaking, the more concentrates a cow receives, the narrower the nutritive ratio of her daily ration becomes.

From table 1 it is clear that the nature of the roughage will determine how high the concentrate ration must be in digestible protein and other nutrients in order to fulfil the requirements of dairy cows. For example, if the roughage is low in digestible protein and total digestible nutrients the concentrate ration must be high in digestible nutrients and digestible protein.

Table 2 indicates the amount of digestible protein or crude protein which the concentrate mixture must contain when fed with the various types of roughage. An example is also given of a concentrate ration which fulfils these requirements.

TABLE 2.—*Digestible Proteins Needed in Concentrate Mixtures fed with Roughage.*

Available roughage	Approximate percentage of crude protein in concentrate mixtures needed with roughage.	Approximate percentage of digestible protein in concentrate mixtures needed with roughage.	Composition of Cereal Mixture.			
			Mealie meal.	Oat-meal or dried brewers' grains.	Maize germ meal.	Ground-nut meal.
	%	%	lb.	lb.	lb.	lb.
Legume hay only e.g. lucerne hay or cow-pea hay...	12 to 14	10	900	300	200	100
Legume hay and silage.....	14 to 16	12	500	200	200	200
50 per cent. legume hay and 50 per cent. teff hay; or 50 per cent. legume hay and 50 per cent. sweet- grass hay.....	14 to 16	12	500	200	200	200
Hay, mixed as above; and silage	18 to 20	16	200	200	200	200
Grass hay, teff hay, and silage.....	20 to 24	18	100	200	200	200

The biological protein value of a concentrate ration for cattle will be considerably improved by the addition of 2 to 3 per cent. of fish meal or blood meal.

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The following table is a good guide for the feeding of dairy cows according to the requirements indicated in tables 1 and 2.

(Cows weighing from 1,000 to 1,200 lb.)

TABLE 3.—*Feed Schedule for Dairy Cows with Varying Production.*

Milk produced per day..	lb. 10	lb. 15	lb. 20	lb. 25	lb. 30	lb. 35	lb. 40	lb. 45	lb. 50
Concentrates per cow per day if milk test is 4.0% or lower.....	0	2½	5	7	9	11	13	15	17
Concentrates per cow per day if milk test exceeds 4.0% butter-fat.....	3	5	8	11	14	17	20	22	24
*Hay per day.....	12	13	11	11	10	10	9	9	8
*Silage per day.....	36	38	33	33	30	30	27	27	24
Total dry material in ration per day.....	22	23	24	25	26	27	28	29	30

* As a rule cows are fed hay and silage *ad lib*, but animals weighing 1,000lb. will eat approximately the amount shown in Table 3. For cows weighing more than 1,000 lb., the amount of hay and silage consumed will increase in proportion to the weight of the cow.

Mineral Requirements.

Salt and bonemeal are absolutely essential for dairy cows; 2 to 4 lb. of a mixture of 2 parts of bonemeal and one part of salt must be added to every 100 lb. of concentrate mixture; in addition cows should have free access to this mineral mixture.

Dairy cows build up reasonably large supplies of lime (calcium) and phosphorus in their bone tissue, which can again be liberated for milk production if there is a shortage of these minerals in the ration. No salt reserve is built up in the animal body.

Calculations indicate that the body of a cow weighing 1,000 lb., contains approximately 40 lb. of calcium phosphate but only 3 to 4 lb. of salt. In 10,000 lb. of milk she secretes 30 lb. of calcium phosphate and approximately 20 lb. of salt.

From the above it is clear that proportionately, a cow secretes much more salt in her milk than calcium and phosphorus.

A deficiency of calcium and phosphorus can be met temporarily by using up the reserves stored in the body. There is no similar means by which a deficiency of sodium chloride can be made good.

A cow needs from 20 to 30 lb. of salt annually to replace the supplies excreted in milk, drivel, urine, etc. She should therefore receive 1 to 1½ ounces of salt in her daily ration or otherwise have free access to salt. An average-sized cow requires ± 1 ounce of salt daily for maintenance, plus ¼ ounce for every 10 lb. of milk produced per day. Cattle require more salt in summer than in winter.

The Feeding of Dry Cows.

High-producing cows receive large quantities of concentrates during lactation; consequently it is desirable to feed them well during the short period when they are dry.

Optimum feeding is especially advisable in the case of pregnant cows, which are to calve within 2 to 3 weeks. Cows need a well-balanced concentrate ration to stimulate the growth of udder and tissue of the sexual organs associated with heavy pregnancy. If a cow is not properly cared for during the last weeks of pregnancy, she will be unable to have a good lactation. Cases have repeatedly been observed where farmers feed their cows well while they are in production, but put them on poor grazing when dry. When these cows calve, they are again given good rations but fail to reach a satisfactory level of milk production.

Feeding a cow a good balanced ration during lactation and immediately thereafter putting her on poor grazing, has a detrimental effect on milk production. As a rule, such a cow will not succeed in regaining the high level of milk production of her previous lactation.

The optimum period between lactations is from 30 to 60 days, which allows the cow to build up reserve supplies of minerals, fats and vitamins for the coming period of production.

If pregnant dry cows are kept on good green grazing, it is unnecessary to give them any supplementary feed, since green feed is rich in vitamin A (carotin), protein, minerals and other nutrients, all in a highly assimilable form.

It seems very reasonable that cows should be fed well during their dry periods, since they put on fat very rapidly during the last stages of pregnancy. The storage of fat is accompanied by an accumulation of minerals and vitamins in the animal's body to serve as a reserve during lactation.

Feeding of Young Dairy Animals.

Heifers in the herd, which have reached the age of one year, can be kept on grazing alone, provided the grazing is good. If this is not the case, the heifers should have free access to hay. Lucerne hay is particularly suitable for young growing heifers.

If heifers are due to calve just after reaching the age of two years, they should receive approximately 4 lb. of concentrates per day during their second year.

Heifers to be bred, should be well grown for their age and in good condition.

Feeding of the Bull.

Bulls must receive just sufficient feed to keep them in medium condition. In no circumstances should they be allowed to become over-fat, since that tends to make them sluggish.

It is advisable to add a small quantity of oatmeal to the concentrate ration fed to bulls. Oatmeal is a type of feed which contains a fair amount of manganese, a mineral which is important in the feeding of male animals with a view to promoting fertility.

As a rule, the animal proteins in concentrate rations for bulls give good results, and for that reason 2 to 5 per cent. of fish meal, or blood meal of good quality should be added to the mixture.

Bulls should receive from 4 to 10 lb. of concentrates per day; 6 lb. is a good average. The quantity depends on the amount of work the bull has to do and on his condition.

A concentrate ration consisting of the following, should yield good results: 400 lb. of meal meal; 150 lb. of maize germ meal; 150 lb. of wheaten bran; 150 lb. of oatmeal; 100 lb. of groundnut oilcake; 50 lb. of fish meal. Total 1,000 lb. A 3 per cent. mixture of bone meal and salt must be added to the above

Illustrated Advice.

The following photos with suitable legends give good advice in connection with the feeding and care of dairy cows.

Fig. 1.—The Heifer Calves of To-day are the Dairy Cows of To-morrow.



Good management begins with the correct treatment and care of the newborn calf.

Calves should be born in clean surroundings.

It is absolutely essential that the calf should receive the mother's colostrum, which contains large quantities of vitamin A and helps the calf to build up resistance against disease.

The ordinary procedure is to feed the calf on whole milk for 3 weeks and then gradually to change to skim milk. Calves will drink from 6 lb. to 15 lb. of milk per day, according to their size. The weight of the milk fed, must be approximately 10 per cent. of the calf's bodyweight. At the age of 3 to 4 weeks the calf will begin to nibble green grass or hay, and should then be permitted to eat good hay or grazing. Young calves must always have free access to *clean water*.

Fig. 2.—Good Cows on Good Grazing.



Good grazing is practically the ideal feed for cows, and should form the basis of milk production.

Only high-producing cows need concentrates in addition to good grazing.

Growing grass is rich in proteins and vitamins which stimulate milk production. It contains so much moisture, however, that high-producing cows cannot eat sufficient quantities of it to meet their needs in regard to the carbohydrates required for energy.

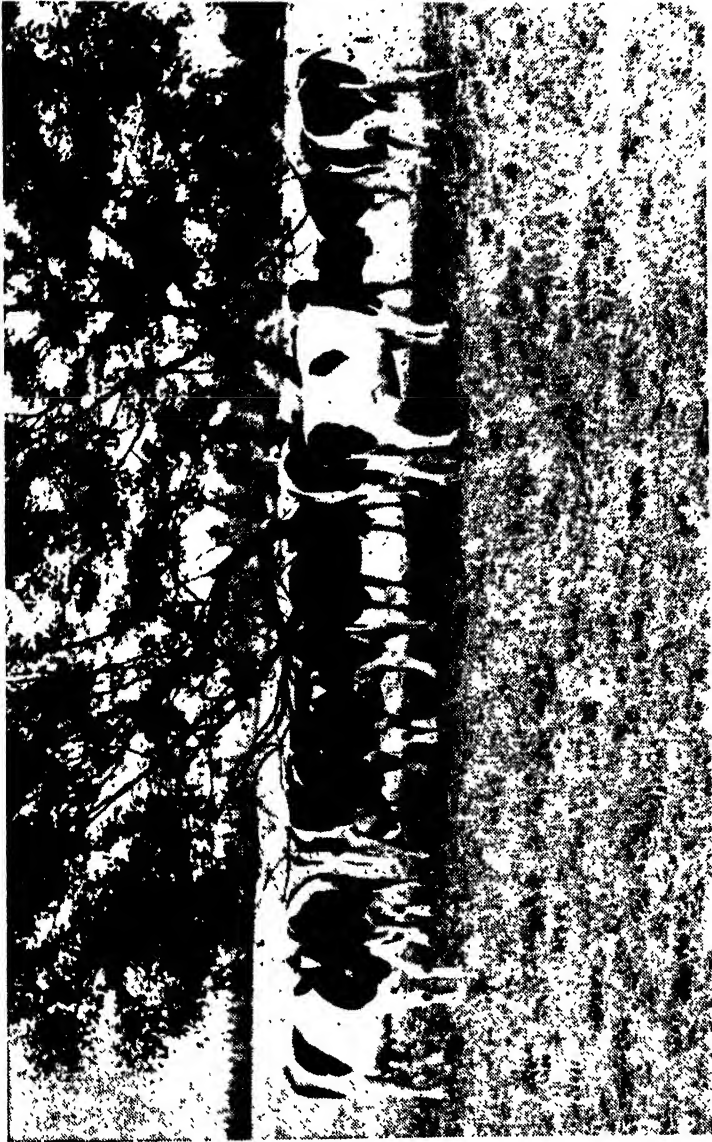
If kept on good grazing, cows can yield 30 lb. (3 gall.) of milk or more per day.

Cows kept on good *early* summer grazing or pasture must receive 3 to 4 lb. of concentrates for every gallon they produce in excess of 3 gallons.

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If kept on summer grazing, they must receive the same quantity of concentrates for every gallon over $2\frac{1}{2}$ gallons. On *late* summer grazing, they must receive the same quantity of feed per gallon for production exceeding $1\frac{1}{2}$ to 2 gallons.

Fig. 3.—Cows Peacefully Chewing the Cud in the Shade of a Tree.



Cows on summer grazing need shade during the hottest time of the day.

Cattle have few sweat glands, consequently they cannot stand heat.

Excessive heat has a considerably depressing effect on milk production.

Cows are particularly sensitive to temperatures above 85° F. Their production can decline by as much as 30 to 40 percent, if they have no protection against direct sunlight on hot days.

It is advisable to plant shady trees or to erect shelters against the direct rays of the sun in the grazing camps.

Fig. 4.—Cows on their way to the Stable to be Milked.



When cows are taken to the stables to be milked, they must walk slowly.

Experiments have shown that cows driven hurriedly to the milking shed, yielded 30 percent less milk than those allowed to walk slowly, even over shorter distances than 1 mile.

If the grazing is poor, it is a waste of energy for the cow to walk so far.

THE FEEDING OF FARM ANIMALS.

High-producing cows tire quickly, with a resultant decline in milk production.

For this reason town-dwellers must never allow their servants to fetch cows by bicycle, since this can cause a decrease of at least one third in their milk production.

Rapid movement and the consequent shaking of the udder may result in injury.

Fig. 5.—Silage is an Insurance against Drought. Cows Revelling in Grass and Lucerne Silage.



Dairy farmers on the highveld and in areas where silage crops can be cultivated, must seriously apply themselves to producing as much silage as possible.

Silage is an excellent succulent feed for winter feeding. It is rich in carotin (Vitamin A) which, as a rule, is scarce in winter feed.

The succulence in silage promotes the digestion of dry hay and supplements the deficiency of nutrients in hay. Silage can be made from maize, sorghums, legumes, grasses, etc.

Cows can consume from 30 to 50 lbs. of silage per day.

Half of the cow's daily hay ration can be replaced by silage, viz., on the basis of 3lb. of silage to replace 1 lb. of hay.

Remember that silage made of legumes, grasses and cereals fits into a scheme of conservation farming.

Fig. 6.—Large Haystacks are the Best Insurance against Drought.



In areas where no winter grazing is available, a large supply of good quality hay must form the basis of winter milk production.

Cows will eat more hay if it is fed out-of-doors. Hay must be eaten from racks and the haystacks must be in sheltered spots where trees form protection against the winter wind.

On the accompanying photograph, the haystacks are in the correct spot, but the lack of hay racks causes waste.

If the cows have free access to water near the hay racks, they will eat more hay and will be less inclined to become constipated.

Dairy cows fed on dry hay, with no free access to water, frequently develop digestive disturbances.

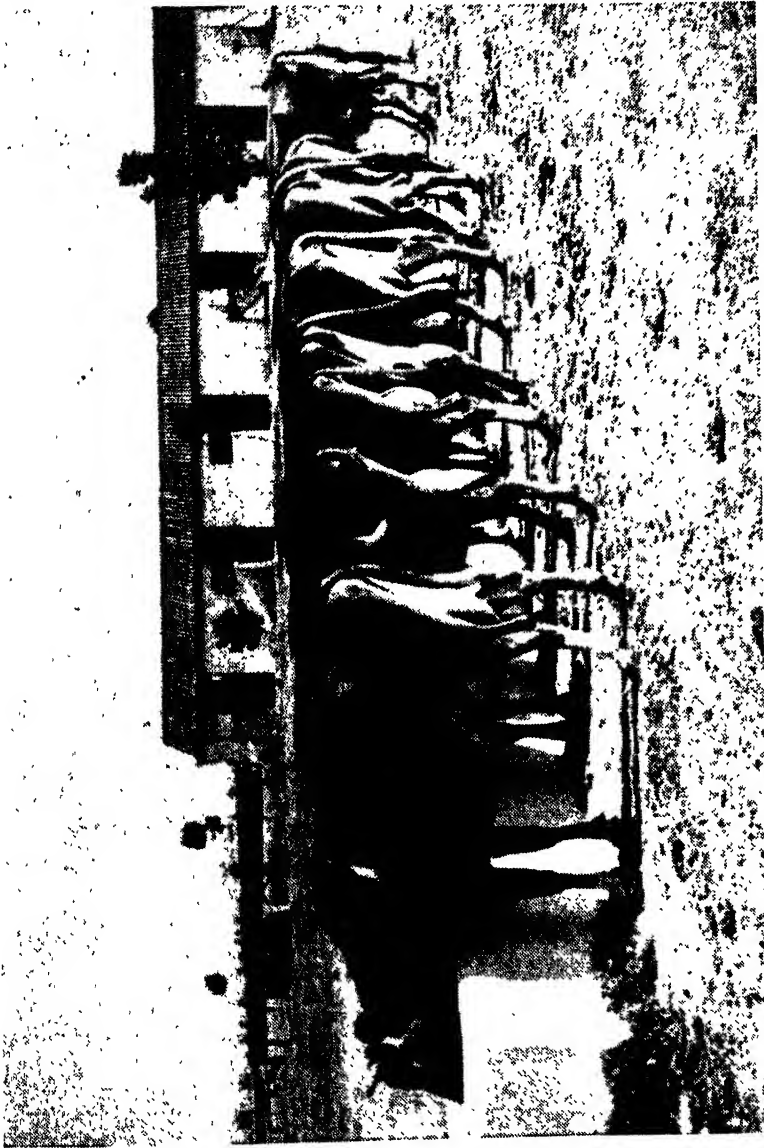
Hay alone cannot fulfil the requirements of good cows. For this reason silage, which increases the digestibility of hay and at the same time contains vitamin A, should also be provided.

THE FEEDING OF FARM ANIMALS.

The quantity and nature of the concentrate fed, depends on the type and quality of hay.

Feed as much hay as the cow will eat in a day, i.e. approximately 2 to 2½ lb. of hay for every 100 lb. live weight or 1 to 1½ lb. of hay plus 3 lb. silage for every 100 lb. live weight.

Fig. 7.—Cows in Milk Must Always have Free Access to Water.



Water promotes the effectiveness of feed utilization and to a large extent, prevents digestive disturbances.

High-producing cows are the greatest water-drinkers.

Cows drink approximately 4 gallons of water for every gallon of milk they produce.

Cows with free access to water drink more than those receiving water two or three times per day.

Experiments carried out with dairy cows showed that cows which have free access to water produce 7 per cent. more milk and 6 per cent. more butterfat, and drink 8 per cent. more water than cows which receive water two to three times per day.

The water must be clean. Dirty water can be the cause of internal parasite infestation.

Fig. 8.—Cows on Grazing under Irrigation.



Cows make excellent use of grazing under irrigation; as much as 3 to 5 gallons of milk can be produced on such grazing without the aid of supplementary feed.

In areas where winter cereals can be cultivated, farmers are advised to make more use of these crops for the feeding of dairy cows.

Winter cereals are an even better and cheaper source of succulent feed than silage.

Fig. 9.—Good Cows in a Clean, Well Ventilated Stable.



Do not milk cows in a dirty stable, and do not feed them anything with a strong odour just before milking.

Experiments have proved that strong odours such as that of silage, inhaled by the cows, can be detected in the milk within ten minutes. The milk itself will not, however, readily absorb the odour.

For every gallon of milk produced, cows should receive approximately $3\frac{1}{4}$ lb. of concentrates before milking.

Fig. 10.—Improve the Dairy Herd by using Good Bulls.

Good bulls, possessing the ability to transmit high milk and butterfat production to their daughters, must be used if the dairy herd is to be improved.

Good care and feeding will contribute towards prolonging the useful life of the bull.

A small well-fenced, sheltered grazing paddock furnishes the bull with green grazing and room for exercise, which will increase its fertility.

If the bull is not kept on grazing, it must receive good hay and silage.

A bull used for breeding purposes must receive from 4 to 8 pounds of concentrates per day, according to its condition.

Do not isolate a bull. Allowing a few young bulls to graze with him, will do much to prevent viciousness. An isolated bull often becomes treacherous and dangerous.

THE FEEDING OF FARM ANIMALS.

Remember that a fat bull looks attractive but as a rule is sluggish. For the best possible service, a bull must be kept in good condition but should receive sufficient exercise, to prevent its becoming overfat.

Fig. 11.—Progeny to be Proud of ; a Good Bull with a Number of his Daughters.



Each of the daughters of this bull, having completed a lactation at the age of 2 to 3 years, has produced more than 10,000 lb. of milk.

Rapid growth and calving at an early age stimulates the growth of the udder tissue, which promotes milk production and increases fertility.

Young heifers in milk should receive 3 to 3½ lb. of concentrates for every gallon of milk produced.

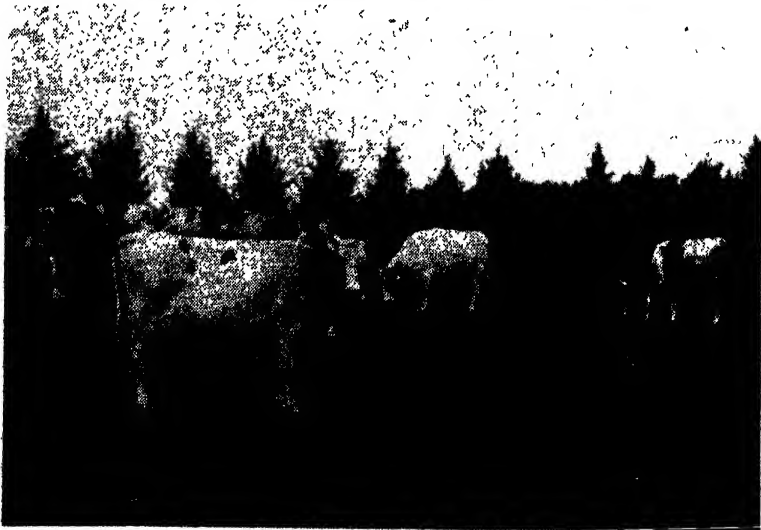
Do not allow poor feeding to retard the growth of young cows during the first few lactations.

Fig. 12.—A Well-fed Dairy Cow.

The milk production, fertility, health and longevity of dairy cows largely depend on good herd management and effective feeding.

The prevention of disease through good feeding and management, is more important than the treatment of sick animals.

Good feeding and care will do more to build up a healthy herd, than any amount of curative veterinary services.

Fig. 13.—A Group of Promising Young Cows.

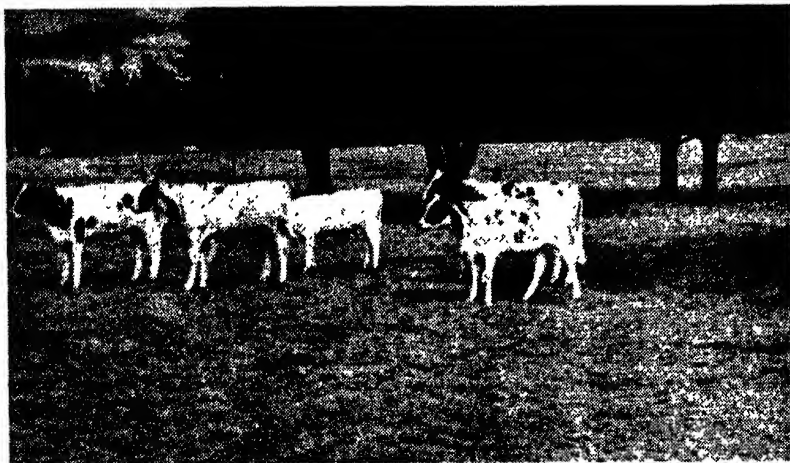
As a rule, well-fed heifers grow better and develop into better producers than poorly fed animals.

Well-grown Friesland heifers may calve at the age of 2 to 2½ years, Ayrshires 3 months earlier and Jerseys often calve at the age of 21 to 24 months.

Rapid growth and calving when still young stimulates the growth of udder tissue, which promotes milk production and increases fertility.

Good grazing during the summer months and plenty of hay and silage during the winter months promotes the development of stomach capacity in heifers. Young heifers from 1 to 2 years of age, should receive 3 to 6 lb. of concentrates per day.

Fig. 14.—A Number of Well-Grown Young Heifers.



High fertility in dairy cows can be achieved by good feeding, rapid growth and breeding at an early age. Well-fed heifers usually become better producers than poorly fed animals.

Young heifers must receive good quality hay or good grazing to supply them with sufficient energy, and to develop their stomach capacity.

To ensure rapid growth, heifers must receive an ample supply of protein. Good quality legume hay or concentrates will fulfill these requirements.

Heifers from the age of one to two years will consume on an average 10 to 18 lb. of good hay and approximately 3 to 6 lb. of concentrates per day.

Danger of Trees and Shrubs on Earthen Embankments.

J. J. O. Pazzl, Senior Engineer, Division of Soil Conservation and Extension.

NUMEROUS farm dams and other earth banks have been built since the introduction of the water-conservation and soil-erosion control schemes and it may be assumed that the conservation campaign has not yet reached its peak, since the number of dams and other earthen structures completed every year is still increasing. It may also be assumed, however, that some of the first dams, completed about ten to twelve years ago, have become unserviceable and are in need of repair.

Why have these dams fallen into disrepair? Apart from unavoidable circumstances, we often find cases where dam walls or earth banks have been completely or partially destroyed as a result of carelessness. We usually find that during the first year or two a careful watch is kept over these structures, but that both interest and watchfulness wane after the walls have been successfully subjected to a few severe tests. Except in the case of gradual sinking or trampling or caving in as a result of spillway erosion, trees and shrubs growing on dam walls are responsible for unexpected disasters.

Let us examine briefly how trees and shrubs can be the cause of such unpleasant surprises.

As trees on banks increase in age and size and are subjected to greater wind-pressure on these exposed spots, the danger of their falling also increases, especially after soaking rains. The roots often penetrate almost as far as the water in the dam and when such roots are torn out when the tree falls, the water can easily filter through the small tunnels formed in this way. After filtering in, the water begins to seep through, forms a trickle and, before long, causes a breach in the wall.

The same results can be expected when trees on dam walls die. The roots will gradually rot away, leaving small tunnels through which water can easily penetrate.

Apart from the abovementioned factors, there are others which may have the same results.

In the course of time, old leaves, twigs and seeds collect under the trees and attract insects and rodents. Among these insects we find that anti-waste army, viz. the termites, fired with the one purpose of storing underground all obtainable plant refuse. Their small passages easily develop into channels which lead to breaches in the walls. The humus layer under the trees will also attract other insects and beetles and these, in turn, attract insect-eating animals. Mole-holes, e.g., make even better canals than termite tunnels and once the water has penetrated through these channels, the leak rapidly develops into a breach.

If, in addition to trees, there are other shrubs and/or bushes on the earth bank, the safety of the wall is still more seriously threatened. Offering perfect safety from hawks and owls, the ground where these shrubs grow, is infested with various rodents, digging and forming tunnels which will be far advanced before they become noticeable to the human eye, except under careful examination. Even fairly large tunnels such as those made by springhares and meercats, etc., often remain unnoticed.

Since practically all earth banks erected for the control and/or utilization of flood water, are in disuse during the greater portion

Berry Culture.

H. B. Terry, Professional Officer, Division of Horticulture.

THE needs of manufacturers have hitherto to a great extent been met by the importation of berry pulp, but with the development of local industries and the expansion of South African markets, the production of large quantities of berry fruits for local canning and preserving companies has become very necessary. All these berry fruits have proved themselves adaptable to the varying



FIG. 1.—Youngberries trained on 2 wires on T-piece with lower wire 3 feet from ground. The supporting framework held by the man in the photo is intended to take the weight off the wires when carrying a heavy crop.

climatic and soil conditions of the Union, though care is necessary in the selection of areas for extensive commercial plantings. Berry fruits are among the most perishable products in cultivation and must be marketed more expeditiously than peaches or other soft fruits; fortunately, however, these berries can without fear of deterioration be transported in large containers for preserving, but for use in the fresh state, careful handling, packing and rapid transport are essential.

Since the berry crops ripen over a comparatively short season, several factors will determine the success or failure of the grower to produce heavy crops, chief among these being the initial preparation of the soil, proximity to markets or rail with good service, availability of labour for picking, a dependable water supply, the provision of support for the vines and the selection of varieties to extend the period of production.

Climatic conditions do not appear to restrict the growing of these trailing berry plants, though the plants do indicate a preference for areas where frosts are not too severe and the summer season not subject to abnormally heavy rainfall. The Coastal Belt and the Transvaal Bushveld or middle-veld areas have proved particularly suitable.

As regards soil, it may be said that the plants are not too particular. They thrive on a wide range of soils varying from sandy loam to clay loam, but as the plants are fairly deep-rooted, good

depth and drainage are essential. The preparation of the soil, and also the manuring of the holes in which the plants are to grow, should be as thorough as possible. A plentiful supply of well-rotted kraal manure to which a quantity of superphosphate has been added stimulates strong growth and ensures heavy crops of large berries. Generally, an annual application of 20 tons of old kraal manure, plus 600 lb. of superphosphate per morgen, worked into the soil



FIG. 2.—Youngberries trained on single wires, one above the other; no supports between poles.

during late winter, after the vines have been fastened to their supports, should assist in keeping the plants in production for 10 to 12 years. (This quantity of manure and fertilizer is equivalent to 5 lb. kraal manure and one ounce superphosphate per square yard.) The excessive use of fertilizers containing readily available nitrogen is not recommended, as they may produce soft fruits which are not easily transported.

Planting is done from June to August, according to climatic conditions, the rows being spaced 8 feet apart and the plants 8 to 10 feet apart in the rows. Having marked off the positions for the plants, dig the holes 2 feet square and 2 feet deep, keeping the sub-soil separate from the top; loosen the soil in the bottom of each hole and, when replacing the top-soil in the hole, mix in one 4-gallon petrol tinful of old kraal manure and a handful of superphosphate. Fill up the hole again by scraping in top-soil from the surrounding soil, give water to settle the soil, and, when planting, spread another handful of superphosphate in the soil about the roots. It is not necessary to press the soil firmly about the roots, since the watering will do this sufficiently. The crowns are usually placed 3 inches under the surface.

As maximum yields can only be expected from plants that are provided with suitable support and systematically pruned after fruiting, *trellising and pruning* are of the utmost importance.

Trellising.

The trellis to support the vines should be strong enough to carry the weight of fruit, and, as picking is tedious work and may entail some stooping to reach fruits near the ground, it should be high

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enough to carry the bulk of the bearing surface of the vines. A serviceable trellis is constructed by firmly fixing 3-inch poles at each end of a row at intervals of about 24 feet in the row so as to stand $4\frac{1}{2}$ feet above the ground; then at the top of each pole is fastened a 2-foot horizontal cross-piece to form a T-piece to which stout wires are fixed to support the vines, whilst a single wire should be fastened 3 feet from the ground to assist in carrying the



FIG. 3.—Loganberries.

growths. Another method which has proved successful, is to use a two-wire trellis, the lower wire being fixed to the poles 3 feet from the ground, and another wire $1\frac{1}{2}$ feet higher; the vines are then woven and spaced around both wires in a loose spiral formation. Number 14-gauge wire is required to support the heavy growths on the trellis.

Pruning.

Since these trailing kinds of berry plants produce their fruit on the previous season's vines, pruning cannot be neglected for a single season: The new growths which arise from the crown of the plant are allowed to lie on the ground under the row during early summer; after the fruit has been gathered from the vines on the trellis, *these are cut away at their bases during December or January* to make room for the new vines lying on the ground. Where the new growths are too crowded, weak vines should be thinned out when lifting them up for tying over the trellis during early winter.



FIG. 4.—Booyesenberries—natural size.

Harvesting and Yields.

The perishable nature of the fruit calls for close attention to picking. During the early stages of ripening, the fruits should be picked off every second or third day, but when uniform ripening begins, the crop must be gathered every day. Since there is no need to grade the berries, they should be picked directly into the punnets or containers in which they are to be sold. A commercial crop is harvested in the second growing season after planting, and yields vary according to the quality of the soil preparation and manuring. At each bud the vines develop a spray of blossoms

The Horse on the Farm.

V (b). Feeding and Management of Stallion, Mare and Foal.

Dr. P. J. v.d. H. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

IN the previous section* a general outline was given of the feeding and management of horses, but as success is due mainly to the attention and treatment of individuals or classes of horses, the following chapter will deal with the treatment of these in greater detail.

The Draught Stallion.

The draught stallion should be very muscular, powerful, low-set, blocky and compact. Breed character and masculinity should be evident in a clean-cut face and head, and powerful and well-arched



FIG. 1.—Light Boland mares mowing a good wheat crop in the Western Cape Province.

neck. He must look the part of a vigorous male; a stallion that resembles a mare or gelding in certain features is not likely to prove a good sire. Good action and style are important attributes. He must be free from hereditary unsoundness. Quality and soundness of feet and limbs must be superior and must not be sacrificed for other features—even size and weight which are very desirable. A stallion's progeny, of course, furnish very useful proof of his ability to reproduce himself and the highest sum total of characteristics of his type and breed. One should also secure evidence of the fertility of a mature stallion offered for sale.

The pedigree and individual merits of the parents and family of a young stallion must be carefully examined in order to minimize the uncertainty of his ultimate development and breeding ability.

* See March 1947 issue of *Farming in South Africa*.

Feeding and Grooming.

The owner of a valuable stallion should on personal inspection or that of a reliable deputy make sure that only the choicest and soundest feeds are fed to the animal at regular times and in correct amounts. The main concentrate must be rolled oats with small additions of bran, barley and peanut meal, along with choice lucerne hay. Maize is a risky feed for stud stallions. Clean pasture grass and carrots are valuable aids in promoting health and fitness. The following concentrate mixture is recommended:—

Rolled oats	50 parts by weight.
Wheaten bran	25 " " "
Barley	20 " " "
Peanut meal	5 " " "

In addition, about 10 to 15 lb. of lucerne and teff hay (half and half) should be given.

The amount of concentrates fed per day will vary according to the condition and amount of service done during the breeding season. Great care should be taken never to allow the stallion to put on extreme weight as this is most harmful in a animal intended for the show ring. Rather let the stallion start the breeding season in a thrifty condition and increase his weight during the season. Draught stallions in good condition during the off season will do well on 10 to 15 lb. of the above mixture. With choice hay and a small ration of carrots, even less grain may be advisable to prevent an overfat condition. Mature stallions should not be allowed to exceed 2,000 lb. in weight, 1,950 lb. being more comfortable and safe.

A valuable stallion is worthy of reliable and expert attention. He should be thoroughly groomed in the morning at 5.30 to 6 a.m. and fed a portion of the day's concentrate ration. At 9 a.m. he is fed some hay, grain again at noon, hay at 3 p.m., and the last of the day's grain at 5 p.m. If not worked, he need only be watered at 10 a.m. and again at 4 p.m. A bran mash should be fed at least once a week. Mix 3 lb. rolled oats, 2 lb. bran, 1 lb. barley and two ounces of Epsom salts with water into a crumbly—not wet—condition, and feed this instead of the evening's concentrate feed.

One ounce of calcium carbonate per day should be mixed with one of the day's concentrate feeds, or mix 3 per cent. fine bone meal with the concentrate mixture.

It is most desirable to work the stallion. It keeps him healthy and virile and more contented. He can be used to do practically all of the farmyard routine work and other chores. Either a light four-wheeler trolley or pneumatic tyred cart could be used. During cool weather and the off season he could even take his place in a team.

If the stallion is not worked, he must be given ample exercise in a safe yard, or walked or ridden at least two miles daily.

At night he should be bedded liberally with wheat straw or chopped veld grass free from ticks. The bedding should be sun-dried daily, and the stall washed and disinfected weekly. Cleanliness promotes comfort and health. The stable should preferably have access to the exercise yard—50 yds. long and about 10 yds. wide or even more. A stallion should never be isolated or locked up, but allowed to see and hear all that is going on around him, for then he will be less likely to contract bad habits and vices.

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In the stable he should be protected against flies and other noxious insects. The stable may be darkened and fly sprays used. A good fly repellent spray is made up of 100 parts fish oil, 50 parts oil of tar and 1 part of crude carbolic acid, and may be used on stabled horses and colts and mares in paddocks. Apply the spray with an ordinary fly spray or spongy rags.

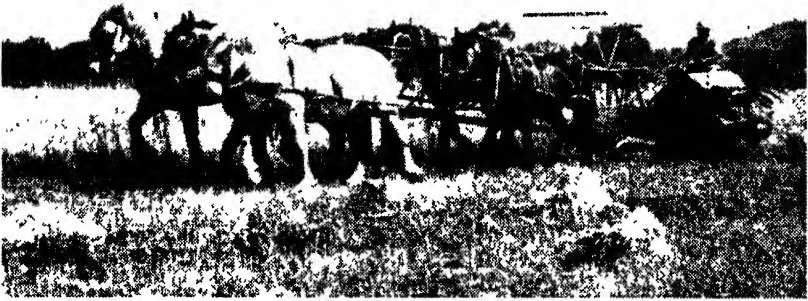


FIG. 2.—The oat-hay crop being harvested.

Shady trees or cheap sheds are very desirable during extreme summer heat. Thorough grooming adds to a horse's comfort and health since it stimulates the action of the skin glands, oils the hair, increases the blood supply to the skin and acts as a tonic to the whole body. A good stiff dandy brush followed by a softer body brush will remove all dandruff and dirt. The currycomb is only used to clean up the brushes or clotted sweat or dirt on the body. After a thorough brushing a soft and slightly damp cloth may be used for a final wiping, the eyes, ears and nostrils being cleaned with a wet cloth.

The feet must be cleaned every morning and painted weekly with a mixture of 10 parts of fish oil and 1 part stockholm tar. Every month or six weeks the feet should be carefully trimmed, and shoeing may be avoided unless this is necessary for show purposes.

The Draught Mare.

The draught mare should be of desirable draught conformation, matronly, and of quiet but active disposition. She should be free from hereditary unsoundnesses, possess breed characteristics in a high degree, and come from a family of regular breeders with profitable utility attributes, and longevity, willingness to work, good temperament, good quality bone and good feet.

Draught mares are generally regular breeders when they are worked regularly and reasonably. Idle mares are unduly expensive and often not regular breeders. Most mares will work moderately

and to their benefit right up to foaling time. About six weeks before foaling the mare should only be used for light work; over-exertion, jerks and bumps must be avoided. Her ration should from now on contain at least 2 to 3 lb. bran a day. If not worked, the mare heavy in foal should be forced to take exercise as she is prone to stand about at this time. After foaling she could be relieved by dry mares or three-year-olds for the first three weeks at least, after which she can return to regular work.

Draught mares are usually bred when they are three years old if well developed and sound in all respects. Fillies should be trained to harness some time prior to the beginning of the season and rested for a while after service. Fillies normally come on heat at 15 to 24 months of age, the period lasting 3 to 7 days. The undesirable practice of running the stallion or colts with the troop, resulting in the foaling of fillies at too tender an age, is as serious a cause of arresting growth and development in our horses as is the lack of a sufficient food supply, and as that cause is preventable it is of the utmost importance not to permit stallions or colts of serviceable age (18-24 months) to run with the troop of mares and fillies. The stud stallion must at all times be under full control and in hand.

The Foal.

A good safe, clean foaling paddock is most often the best if weather conditions permit. The paddocks should be vacated when the foals are old enough (30-60 days) to join others in a larger camp.

Although good foaling paddocks are provided for, it is highly desirable to have a good foaling box to use in case of abnormal births or severe weather conditions.

This box should be about 16 feet by 16 feet with a high manger and no other obstructions. It should be spotlessly cleaned by thorough disinfection and scrubbing of the floors, manger and walls. Here the mare must be well bedded down at night with clean fresh straw, and have the run of a small, clean, well-shaded paddock during the day, if the weather permits.

The foaling paddocks should be contiguous, allowing only one mare per paddock a month prior to foaling and a month after-foaling. New-born foals run great risk of being kicked to death by other horses. Brood mares with foals at foot should be run together only if friendly and well behaved, when the foals are about a month old. They should never be run in camps containing other stock, and least of all with mules that may worry the foals to death.

Foaling mares should not be run with barren mares that are apt to tease and even kick. Foaling mares are more sedate and can be run together up to a month before foaling. Some institutions groom foaling mares regularly, while others only keep mares' tails, fore-tops, feet and legs tidy and clean. Just prior to foaling, 8 to 10 inches of the tails (docks) may be clipped or bandaged for the sake of cleanliness.

In order to secure a good foal crop and to retain mares as regular breeders, they should be kept in a thrifty, moderate, condition throughout the year, whether worked or idle. Mares should not be permitted to go down in condition after the nursing period. During their dry period they should receive such feeding and care that they will be in a fit condition for foaling and nursing. If they are worked

THE HORSE ON THE FARM.

when in foal or suckling a foal, they will, of course, receive work-horse rations, but even then a little additional feed will be necessary.

Dry mares should run on good pastures supplemented with good roughage, a third of which must be a legume hay, and even some grain if the winter is severe.



FIG. 3.—While the mothers are at work, these weanlings are safe in a shady and well constructed paddock with wooden rails.

In working mares with foals at foot, care should be taken against over-working, over-exertion and over-heating. The foals, which are either locked in a large barn or stall or placed in a safe wooden-railed paddock, should have access to their dams only when the mares are thoroughly cooled off, and even then it is advisable to draw a little milk from each teat before permitting the foals to suckle.

Care of the Foal.

The pregnant mare in her paddock should be unobtrusively watched daily. The foaling date in a well-regulated stud will be known, but even so mares may be early or late by a few days to three weeks. Fulness of the udder, wax on the teats and a marked sinking of the croup muscles are signs that foaling is about due. The feeding now should be light, laxative and moderate in amount and bulkiness.

Shortly before foaling, the mare becomes restless. Lying down and rising frequently, sweating and frequent urination are indications of approaching parturition. The normal presentation is the front feet followed by the nose. Healthy vigorous mares usually foal within 15 minutes. Any other presentation may cause delay in foaling and smother the foal. With prompt assistance the life of the foal may be saved.

Respiration in such an assisted foal is often aided by artificial respiration and the prompt removal of the mucus film from nostrils and mouth.

The navel cord usually breaks near the body; if it does not, it can be severed by scraping it with a disinfected knife or blunt shears. The navel, feet and nostrils should be painted immediately after birth with a 10 per cent. solution of iodine (the treatment being repeated after a few hours) and then dusted with a good antiseptic drying powder. Continue this treatment for the next few days until the stump is dry and healed.

If all goes well, the mare should be permitted to rest for a few hours after having had a bran mash and a light drink. The after-birth should be discharged within 2 hours and must be buried or burned. A difficult birth that causes bruising or retention of the afterbirth should receive immediate veterinary attention. Temperature after parturition will indicate the return to a normal condition and should read about 101° F.

The new-born foal should be on its feet and nurse within half an hour or earlier; and in the case of awkward or weakish foals guidance should be given. Make sure that the foal's bowels act within a few hours; if they do not, a lukewarm water enema containing a little glycerin or raw linseed oil may be administered. In severer cases of constipation a dose of an ounce of castor oil mixed with the dam's milk should be given.

If there is no elimination of the meconium in a new-born foal within 12 hours, an enema of lukewarm olive oil or a rectal douche of lukewarm soapy water must be administered. Do not let dams nurse their foals when they return hot from work or excited after service, since diarrhoea or scours may result. The mare should be milked a little and the foal made to wait for a fresh supply of milk.

In the case of diarrhoea, often caused by too much milk, cut down the mare's ration severely and even handmilk her several times a day.

If prior to foaling, a mare is properly fed a ration containing a laxative foodstuff, her first milk will contain Nature's laxative for the foal.

The most dreaded foal disease is navel or joint ill. Its origins often lie to a large extent in unsanitary conditions of the stallion and mare at breeding time and may be prevented by the strictest sanitary and hygienic practices.

The young foal should be handled often so as to be on friendly terms with the grooms. The feet and legs are often handled so that half his training is done at weaning, and "breaking in" later is obviated. The feet should be cared for regularly. Serious defects of feet and legs can often be prevented. Adjustments can be made to incorrect placement by suitable shoeing or other means. The observant horseman, assisted by a skilful farrier, can do a great deal towards preventing unsoundnesses of feet and legs.

The Orphan Foal.

If an orphaned foal cannot be nursed by another mare, milk from a cow with a low butterfat test must be used. Mix into a pint of this milk 3 to 5 tablespoonfuls of limewater and one tablespoonful of sugar. Warm the milk to body heat and feed a $\frac{1}{2}$ pint every hour

THE HORSE ON THE FARM.

for the first few days. Increase this amount as the foal grows. After a month the sugar can be omitted and within six weeks skim milk can be used entirely. At this time the foal must be coaxed to take concentrate feed and hay. Raising an orphan foal is a task calling for perseverance, punctuality and cleanliness. Good orphan foals are fine pets and can be developed into very useful animals.



FIG. 4.—Stud mares and foals in a safe paddock with good grazing.

Weaners.

Foals should be accustomed to eating grain and hay before they are weaned at the age of six months. If their dams are worked and they are stalled or placed in a safe paddock, they should be provided with small amounts of their dam's ration—grain and hay. If mares are idle and pastures good, very little, if any, additional feed is necessary; but such conditions do not obtain for long in any part of South Africa and to assure full development additional feed is always beneficial and profitable.

It is desirable to wean foals in a bunch or in pairs for company and better behaviour. If they are weaned singly, it is best to run a few quiet barren mares with them and their dams so that when the dams are removed they have company. Some mares are often good milkers and their udders must be stripped two or three times a day to prevent discomfort or more serious trouble. Since foals are practically independent of their dams at weaning time, they can be left for a while in the paddock they are accustomed to. The foal of a blind mare is belled when she is suckling it.

Yearlings.

In developing yearlings for the show or sale, they must display their best form and must be fed regularly but moderately. Over-feeding is as harmful as under-feeding. It is a very bad practice to neglect weaners and then force them as yearlings, since puffy hocks and knuckling at the fetlocks often result.

Both the weaner and yearling must be protected against internal parasites. Foals and weaners should be freed of ticks every day (or at least once a week) and groomed thoroughly.

If foals, or other horses for that matter, rub the hair out of tails or manes, these parts should be washed thoroughly with soap and water and a soothing ointment of lard and sulphur applied. Melt the lard and add as much sulphur as it would take to make a stiffish salve.

Clean pastures, clean stables and a fresh, clean water supply are effective aids in parasite control.

Draught-horse colts and fillies make about 50 per cent. of their mature weight during the first year, and it is therefore of the utmost importance to provide all the necessary facilities for feeding and care during this vital period. Heavy grain feeding is not necessary; in fact, it is even dangerous for it produces an excessive condition at greater expense and entails risks of unsoundness and bad health. A combination of roughages—good lucerne hay, sheaf oats and sweet-grass hay—when pastures are good, will give good results. Additional grain feed consisting of oats and crushed maize, half and half, should supplement grazing and roughage when either or both sources of feed are not of the best.

The observant and experienced horseman will watch development and condition, and feed accordingly. The following average weights of draught horses will guide the breeder:—at birth, 130 lb.; at 12 months, 1,000 lb.; at 24 months, 1,400 lb.; at 36 months, 1,700 lb.; at 48 months, 1,900 lb.

Training of Young Horses.

The training of colts should begin at an early age. In handling the new-born foal for disinfection purposes, put the arms round the chest and buttocks. Never handle the neck or legs at this age. Keep on handling the foal frequently. A sugar lump establishes cupboard love and foals soon come up when called. Foals handled often and kindly have less fear of man and are approachable in pasture or stall. Grooms must be kind but firm. Obedience to certain commands must be taught in a coaxing and friendly way rather than with harsh shouting and coarse handling or whipping. A leather halter with broadish neck band is put on at an early date and the foal is handled for a few moments each day. Do this preferably in the exercise yard where injury from manger and walls is not possible.

Teach the foal to lead with its mother for a day or two and then to lead at a walk and trot without its mother. Teach him to start and to stop and to stand squarely with head up, but teach him only one thing at a time. All lessons later on should be of short duration and oft repeated. Handle feet and legs frequently. Tough, strong, well-shaped feet and pasterns are in a large measure the result of proper and timely care given to the foal's feet. The wearing may be uneven and the placement of feet and pasterns may be permanently affected. The feet should be examined at least once a month and be trimmed, if necessary, to bring equal bearing and wearing on all parts of the wall of the foot.

THE HORSE ON THE FARM.

Pure-bred, registered colts are usually prepared for sale at two years of age. They are taken in hand as yearlings and taught good manners, obedience and attentiveness. If foals are handled daily from birth onwards, half the task is done. When one has to deal with colts left untouched until three, one marvels at the gentleness of colts handled from foalhood. These strong youngsters can be veritable beasts, and the "breaking in" is often dangerous and painful.

Well-developed two-year-olds can be trained to harness and do a little light work, but it is preferable to start serious training and use at three.

The colt used to handling is a simple proposition. He is harnessed and led about—one groom at the head and another at the reins. He is first accustomed to bit and rein, and to obey certain commands. He is then coupled to an older and steady horse and again the pair make several rounds. When the preliminary lessons have been learned and his behaviour is exemplary, the pair can be hitched to a light wagon with good brakes. For the first few moments a groom could be at his head and talk to him encouragingly. Whipping, shouting and any strange handling that may excite the colt should be strictly avoided. The groom, if not the trainer, should be present throughout the training process. The restraining and encouraging influence of a known voice from a person who has always been kind, is very helpful indeed.

Training veld-reared colts is a proposition calling for experience, great patience, kindness and strength. The colt's "mind" must be disabused of fear. Even in the roughest but necessarily firm handling he must be talked to kindly and patted. As soon as he is in hand, he should be joined by an older, quiet and gentle horse he knows. Often it is desirable to let him go for a day or so with the halter on to accustom him to the feel and smell of it.

Once he has learned to walk around coupled to the older horse, he can be harnessed and again taught to make rounds with the harness on. Once he is accustomed to the harness and other things about his body and legs, the pair may be hitched to a light wagon. None of these processes should be overdone, least of all the first pull in harness. The preliminary lessons are best given in a large kraal or wooden-railed exercise yard.

A horse-breeding proposition of any pretention must provide a good horse crush leading off from a smaller kraal or paddock. The horse wanted is coaxed into this crush and safely secured. The crush is built like an ordinary cattle crush, only higher and closed in on top as well. From a V-shaped inlet the horse enters a crush made of stout, strong smooth poles, about three horse-lengths (25 feet) long, 30 inches wide and 8 feet high. A strong door entirely closes the exit; it is also barred and narrow enough (3-5 inches) to prevent the horse from putting its head through. The side rails of the crush should be 8 to 10 inches apart and supported every 3 feet by strong uprights. Such a crush is indispensable to the horse breeder and helps him to attend to his horses individually in dosing for worms, inoculation against horse-sickness and anthrax, taking blood tests for dourine or handling them for any necessary purpose.

The untrained youngster from the veld is secured here and coupled through the side of the door and door-post to the older horse outside the crush. Transverse posts are inserted behind the horse. When he has been captured in this section, allay his fears by every possible means—kind words, whistling and patting.

The crude method of securing a wild youngster with the choking lasso (vangstok) borders on the criminal and should not be used by a breeder of any standing, least of all by those who handle valuable horse stock where improved methods of management, treatment and care should be practised.

Never attempt to "break the spirit" of a very vigorous and spirited horse. The trainer should anticipate any emergency. Only strong ropes and harness should be used. Patience, kindness and skill should be the main attributes of the trainer. The short-tempered, cruel person should not be tolerated with livestock and least of all with horses.

Use three-year-olds lightly during late winter so as to harden them for work in early summer. The breeding season will call fillies to stud and the usual treatment should be given them during that period.

Berry Culture :—

[Continued from page 380.]

similar to that of the well-known blackberry, and individual plants produce from 15 to 35 lb. of fruit per season. A good picker can easily pick up to 200 lb. of berries per day.

Kinds of Berry Fruits.

There are several kinds of trailing berry fruits which are being grown in various parts of the Union, and among these the following are considered worthy of further planting :—

(i) The *Youngberry* (the thornless variety being an improvement on the spiny one because of ease in handling), which produces large, firm, almost seedless fruits of a deep wine colour, changing to a jet black as they mature. The flavour is excellent.

(ii) The *Dewberry* which ripens a week or two earlier than the *Youngberry*. The fruits are fairly large, jet black and of good flavour.

(iii) The *Booyzenberry* which produces large clusters of black fruits and ripens about two weeks later than the *Youngberry*.

(iv) The *Loganberry* of which there are both thornless and spiny varieties. They produce an abundance of large, long, dark red berries of good quality with a sub-acid flavour.

Thus, by planting a selection of these trailing berry fruits the production season can be profitably extended.

Annual fertilizing plus a plentiful supply of water at all times is essential for maintaining vigour and good crops.

Propagation.

Nearly all of the trailing varieties such as those under review are increased by layering. The method adopted is to cover the end of the growth with a spadeful of soil during the latter part of the summer. The point covered sends down roots and forms a plant which may be transplanted in spring.

Sex Identification in Chickens.

Prof. A. M. Gericke, Department of Poultry Husbandry,
Agricultural Research Institute, Pretoria.

THE development of the poultry industry has created a large demand for female chickens. Most buyers of day-old chicks are not eager to purchase male chicks because by so doing they must provide about double the accommodation in rearing houses. In certain areas it is unremunerative to rear male chicks to the marketing stage and it is considered more profitable to kill the male chicks at day-old age. Male chicks grow more rapidly than females and therefore these can be raised more profitably at poultry plants catering for the



FIG. 1.—A dark coloured male when crossed with a Barred Plymouth Rock hen produces a dark pullet and a barred cockerel.

production of table birds. Males hatched from valuable strains are, of course, reared for breeding purposes.

Several methods of sex identification in day-old chicks have been investigated, sex-linkage being one of the first to be utilized on a commercial scale.

1. Sex-Linkage : Down-Colour Method.

In 1919 Professor Punnett published the results of several crosses in which the sex could be identified accurately by observations made of the down-colour at day-old age.

The inheritance of sex-linked characters is most interesting. In poultry the male has 17 pairs of ordinary chromosomes and 2 sex-chromosomes, whereas the female also has 17 pairs of ordinary

chromosomes but only one sex-chromosome. The inheritance of sex-characters in poultry is known as the WZ type—Z denoting the presence of the sex-chromosome and W the absence of the sex-chromosome. Because the female has only 1 sex-chromosome she is of the ZW type and the male with 2 sex-chromosomes is of the ZZ type.

It has been established that gold males and females are always pure for colour, but silver males may be pure or impure, whereas silver hens are always impure. In a cross between a gold male (ZZ), such as the Indian Game and Light Sussex females (ZW), silver male and gold female chicks are produced which can be distinguished accurately at day-old age.

Barring, as in the Barred Plymouth Rock, is also a typical sex-linked character. If a black cock is mated to a Barred Plymouth Rock hen, the progeny will all have black down, but the males will have a light spot on the head, while the females will be entirely black. As adults, the females are black and the males have the typical barred colour (Fig. 1). If the opposite cross is made (black hen mated to a Barred Plymouth Rock cock) the down colour of the chicks is not distinct, and as adults all the birds will be barred in colour. It is therefore obvious that a silver female, like the Barred Plymouth Rock, must be mated to a black cock for accurate sexing of the chicks at day-old age.

In the brochure "Sex-linked Crosses", which was published by The Feathered World, the following sex-linked crosses are suggested:

Gold and Silver Matings.

- (A) Light Sussex hens crossed with males of any of the following breeds: Rhode Island Red, Brown Leghorn, Buff Rock, Buff Leghorn, Barnevelder, Marsh Daisy, Red Sussex, Brown Sussex, Buff Orpington and Welsummer.
- (B) Columbian Wyandotte hens crossed with Rhode Island Red or Barnevelder cocks.
- (C) White Wyandotte hens crossed with males of any of the following breeds: Rhode Island Red, Buff Rock, Brown Leghorn, Buff Leghorn and Old English Pheasant Fowl.
- (D) Other Gold and Silver crosses: Brown Leghorn cock × Duckwing Leghorn hens, Gold Campine Cock × Silver Campine hens, Gold Laced Wyandotte cock × Silver Laced Wyandotte hens, Gold Laced or Pencilled Hamburg cock × Silver Laced or Pencilled Hamburg hens.

The disadvantage of sex-linked crosses is that both gold and silver breeds must be kept. The mating of crossbreeds is not recommended because the sexes cannot be identified at day-old age and the adult birds will consist of a mixture of various sizes and plumage colours.

Sex Identification in Pure-bred Plymouth Rocks.

It is well-known that in this breed the shade of the feathers in hens is usually darker than in cocks. Quinn and Knox (1939) observed that the chief difference between male and female chicks consists in the intensity of the black pigment in the down and shank colours. Male chicks have silver and black heads, and females have white and black heads. Male chicks usually have larger head spots than females, and the colour is silvery white. In female chicks the head spots are usually smaller, with contrasting black and white in

SEX IDENTIFICATION IN CHICKENS.

the down of the head. Male chicks are silver gray, silver black or dull black on the back, and females are deep brilliant black. Both males and females may carry silver striping on the back. Male chicks are silver and white in the face and throat, and females are black with white spots. Male chicks are silver gray in the abdominal region, usually with 2 white spots, and females are dark ashy gray with 1 or 2 spots, black with white spots or entirely white. Male chicks have yellow, yellow-ringed or dusky yellow shanks, and females have black or dark shanks with the dark pigment usually broken off rather abruptly. Male chicks have yellow toes or yellow-ringed toes, and females have black or dark toes with yellow appearing at the extremities.

In the above investigation the accuracy in sex identification was from 83.5 to 91.8 per cent.

Jerome (1939) observed that in Barred Plymouth Rock chicks at day-old age the head spots of males are irregular in outline and scattered in appearance, while in females the head spots are more regular in outline. In sexing he obtained an accuracy of 90 per cent. or better when the head spots were considered, and 95 per cent. when the colour of the legs was included. Warren (1942) did not consider shank colour to be of value in sexing, because the colour is not sufficiently developed at hatching and sometimes the sexes can be distinguished only after they are a few weeks old.

There are several types of head spots in Barred Plymouth Rock male and female chicks, and the variation in the size and colour of head spots will probably influence the accuracy of sexing when chicks bred from different strains are examined.

2. Rate of Feather Development.

Warren (1942) stated that the more common breeds and varieties fall into two groups: the early and the late feathering. The terms early and late refer to the age at which the adult plumage begins to replace the chick down. Three methods are used to determine the rate of feathering: (a) the length of the primary feathers at day-old age, (b) the length of the tail feathers at 10 days of age, and (c) the feather growth over the back from 4 to 8 weeks of age. The primary and secondary wing feathers are the first to develop, being visible in some breeds at hatching. In studies of the rate of feathering, the age at which tail feathers appear has been found to be the most definite basis of classification. In early-feathering breeds the tail feathers appear at from 6 to 8 days of age, and in late feathering ones these feathers do not appear before the 20th day.

The White Leghorn has a dominant white colour and therefore this breed cannot be used in any cross to distinguish the sexes at day-old age by the down-colour method. Leghorns are rapid feathering, whereas most heavy breeds are classified as slow feathering. Slow feathering is sex-linked and dominant to rapid feathering. This is illustrated in the following matings:

When a White Leghorn male is mated to Jersey Giant females, all the female progeny will be quick feathering, while the males will be slow feathering. When a Jersey Giant male is mated to White Leghorn females, all the progeny will be slow feathering.

The inspection of the wing feathers should be done as soon as the newly-hatched chicks are dry and fluffed out. This method is used commercially with a high degree of accuracy.

Factors which will influence sexing by the feather-growth method are briefly:—

If breeding hens are not pure for late feathering, the sexing of chicks will be difficult. In recent years late-feathering breeds such as Australorps and Rhode Island Reds, have been bred for early feathering, and the use of these females for breeding to early-feathering males, such as the White Leghorn, will complicate sex identification in their chicks at day-old age. For cross-breeding purposes, a late-feathering heavy breed can be bred by eliminating early-feathering chicks between 10 and 20 days of age. At this age,



FIG. 2.—A slow feathering Australorp chick at 42 days of age. Note the naked back.

early-feathering chicks will show tail feathers. In Leghorns—an early-feathering breed—the wing and tail feathers are well developed at 9 to 12 days of age.

In the breeding of pure strains of poultry, late-feathering individuals are usually culled because the male chicks grow their feathers slowly and their backs are bare or naked even up to 6 or 8 weeks of age. For marketing as broilers these "naked-back" male chicks are unattractive and do not command the best price. This is the chief disadvantage of the feather-growth method of sex identification. (Figures 2 and 3.)

3. Wing-spot Method.

Jaap (1946) described the wing-spot method of sexing Rhode Island Red and New Hampshire chicks at day-old age. He obtained an accuracy in sexing of 90 to 95 per cent. in Rhode Island Reds and from 80 to 90 per cent. in New Hampshires.

SEX IDENTIFICATION IN CHICKENS.

The identification mark in day-old male chicks is a white or yellowish white spot on top of the wing in the region of the wing web. The wings of the female chicks are uniformly red in colour.

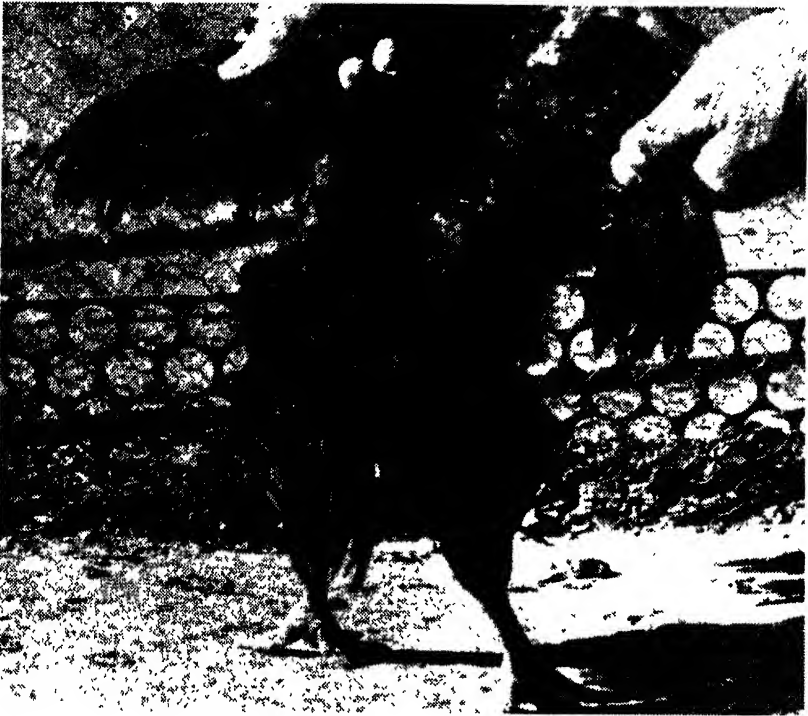


FIG. 3.—A rapid feathering chick at 42 days of age.

Errors in sexing are most likely to occur in uneven and light-coloured chicks when the wing spot is very small or indistinct. The chicks must be sexed as soon as they are dry and fluffed out.

4. Japanese or Vent Method.

In 1936 the late J. P. van der Merwe described the Japanese method in detail in Bulletin 175 published by the South African Department of Agriculture.

This method entails the examination of the vent or cloaca of day-old chicks in which slight anatomical differences are present in male and female chicks. The sexual organ is situated at the bottom and on the inside of the vent. The following anatomical differences can be recognized if the proper pressure is applied to the abdomen—

- (a) about 30 per cent. of the chicks show no sexual organ and are all females;
- (b) about 19 per cent. have very small, soft fleshy organs and are also females;
- (c) about 50 per cent. of the chicks have stiff muscular organs and are all males.

For this method of sexing, skill in handling the chicks and speed in determining the size and prominence of the sex organs are important for reliable results. Experienced and skilled sexers can determine the sex with 95 to 98 per cent. accuracy.

5. Auto-sexing.

This term refers to sexing within the breed, or self-sexing. In 1930, Punnett and Pease introduced the Cambar, a breed which was originated by crossing Barred Plymouth Rocks and Campines. The male chicks of this new breed are of a pale grey shade, striped with brown, and the females are dark brown on hatching. The male Cambar chick has two doses of the barring factor and the female has only one, and as a result the male chicks at day-old age are paler in colour than the females. Some years ago Cambars were introduced into the Union, but only a few of the progeny are still alive.

Punnett and Pease also bred the Legbar which resulted from introducing the barring colour into Brown Leghorns. Working along the same lines at the Oklahoma Experiment Station, Jaap (1940) bred a large-bodied breed which he named the Oklabar. The first cross was made by mating White Plymouth Rocks and Rhode Island Reds. A male chick with striped down and white bars on the feathers was obtained and this male was mated to Rhode Island Red females. By various tested matings the progeny which carried the recessive white colour characteristic of the White Plymouth Rock were removed and these were not used for breeding purposes. Male chicks of a light-coloured blotchy type were finally mated with females which, as chicks, were striped and had cross bars of white on their feathers. It was found that chicks produced from this mating bred pure and that the sexes could be accurately distinguished at day-old age. The male chicks are always lighter in down colour than the females.

The breeding of Legbars with a characteristic Leghorn type requires several generations of selection. Jaap suggested the following matings to produce an auto-sexing Leghorn:—

Light Brown Leghorns are crossed with Barred Plymouth Rocks. In the first cross it does not make any difference which breed is used for the male parent. The first cross-bred males will be smoky-coloured barred birds. These males are mated to Brown Leghorn females. From this stage on only those chicks which have striped down are retained for further breeding. These must be marked at the time of hatching in order that they can be identified as adults. When these striped chicks feather, some will have white bars showing in part of their feathers. From these barred browns select those which most nearly resemble the Leghorn.

The third generation is produced by mating these selected males to Light Brown Leghorn females. Two or three additional back crosses of the same kind of barred brown male to Brown Leghorns may be required to eliminate all the Plymouth Rock characteristics. When the breeder is satisfied that all undesirable characters have been eliminated, the barred males and females are mated together. For the first time some male chicks appear with very light-coloured yellowish white replacing much of the dark-brown or black. These light-coloured chicks are the male Legbars. After they have been used with barred-brown females, the Legbar breeds true. Care must be taken to retain the white bars on the feathers.

SEX IDENTIFICATION IN CHICKENS.

At the Experimental Farm of the Agricultural Research Institute, Pretoria, experiments are in progress on the breeding of Brown Legbars from several breeds of poultry. Light Brown females have been bred from such crosses as: White Wyandotte \times Rhode Island Red, Styria \times Indian Game, Indian Game \times Rhode Island Red and

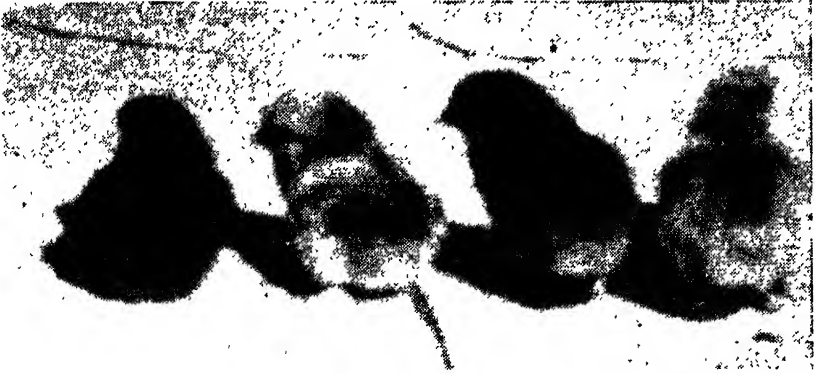


FIG. 4.—A self-sexing breed which is being bred at the Experimental Farm. The male chicks are lighter in down colour than the females.



FIG. 5.—A male and female chick of the new breed. The male chick carries two doses of barring and the female only one.

dark Brown Leghorn \times Rhode Island Red. Through several generations of selection, light brown females have been bred which are now being crossed with Barred Plymouth Rock males. The pure Brown

Legbar bred from these matings, produces a light-coloured male and a dark brown female chick (Figures 4 and 5). Further matings will be necessary to obtain 100 per cent. accuracy in sexing chicks at day-old age. In addition, the economic qualities of this breed will have to be improved.

Other methods of sexing besides those discussed in this article have been suggested, but as experimental proof in regard to their success is lacking, these have been omitted from consideration. No evidence is available that the fertility of eggs or the sex of chicks can be determined before the eggs are placed in the incubator.

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New Bulletins.

The undermentioned Bulletin has recently been published:—
No. 249. Winter Pruning and Trellising of Vines. Price 3d.

An Egg with a Bi-Coloured Shell.

Prof. A. M. Gericke, Department of Poultry Husbandry,
Agricultural Research Institute, Pretoria.

A Black Australorp hen, the pet of Master Nico Bonsma, son of Prof. F. N. Bonsma, surprised the owner in December, 1946 by laying a streamlined egg with one half of the shell a dark brown colour and the other half a light colour. The horizontal line of demarcation between the two colours is distinctly visible, as shown in the accompanying photograph.

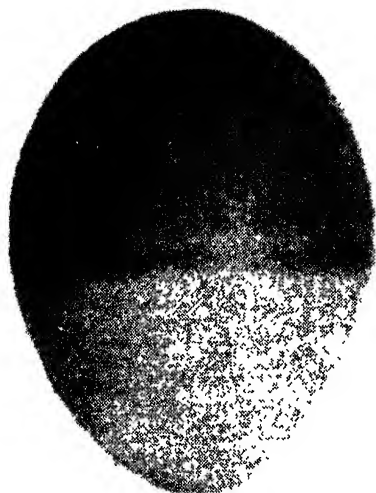


FIG.—Bi-coloured egg, the line of demarcation between the two colours being clearly visible.

The colour of a brown egg consists of a porphyrin pigment which is secreted directly on to the shell by cells lining the uterus. According to Warren and Conrad (1942) the pigment in a brown-shelled egg is deposited throughout the entire period of shell formation. From 50 to 74 per cent. of the shell pigment is added in the last five hours before the egg is laid. If an egg is removed from the oviduct of a hen normally laying brown eggs before the egg reaches the uterus, the shell will be white in colour.

Breeds such as the Australorp, Rhode Island Red, Plymouth Rock, Wyandotte and Sussex lay brown-shelled eggs, but the colour may vary considerably as a result of breeding and seasons of egg production. Hall (1944) found that Rhode Island Red pullets exhibited a distinct seasonal variation in egg-shell colour. The intensity of pigmentation decreased from the time laying started until early summer when there was a slight increase in colour which was retained until the end of the laying year. Dutch breeds of fowls such as the Barnevelder and Welsummer lay eggs with highly pigmented brown shells. Mediterranean breeds of fowls with prominent white earlobes lay white-shelled eggs. The Araucana, a breed with beard

growing from the throat and muffs on the upper part of the neck, is bred in Chile, South America, and lay eggs with a blue shell similar in colour to that of a duck.

No information is available as to the origin of eggs with bi-coloured shells, and therefore an explanation must rest solely upon speculation. It is interesting to note that the superficial brown pigment of the upper half of the shell could be removed by scratching with the finger nail, and on exposure the underlying colour represented the lighter colour of the lower half of the egg. Steggerda and Hollander (1944) reported a similar phenomena in egg shells which showed areas of depigmentation, but the areas were not symmetrical and as clearly demarcated as in the bi-coloured egg. They considered the occurrence of such eggs to be due to a spontaneous separation of the processes of lime and pigment secretion. One may assume that the bi-coloured egg originated as a result of incomplete secretion of colour matter in the uterus, or that the egg was delayed in the uterus during which period the additional colour was deposited on to the upper half of the shell.

Danger of Trees and Shrubs on Earthen Embankments :—

[Continued from page 376.]

of the year, there is even greater danger when ants, moles, mice, meercats, etc., dig their tunnels right through the banks, since that creates the possibility of destruction by the first flood waters of the rainy season. In dams with only a slight permanent inflow, these channels may extend far below the high-water mark, in which case the wall is also liable to break with the first flood.

It is clear, therefore, that we should remain on our guard and that our task will be considerably facilitated if a watchful eye is kept on the wall and its surroundings. Shrubs should therefore be eradicated as soon as they appear and a time should be set aside annually for this purpose.

If general maintenance work such as the filling up of low places, the examination and improvement of paved portions, etc., is done at the same time, the structures will definitely have a longer useful life.

The old saying, viz. prevention is better than cure, remains a sound admonition.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26

APRIL 1947

No. 296

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Price Review for February 1947.*

Fruit.—The markets were fairly well supplied with pears, apples, grapes, pomegranates and quinces. Peach offerings, however, decreased sharply and experienced an exceptionally strong demand. Moderate quantities of pineapples, mangoes, guavas and avocados were disposed of satisfactorily.

Tomatoes.—Tomato offerings decreased, and prices, particularly in the case of tomatoes of good quality increased. On the Johannesburg market, for example prices of National Mark No. 1 tomatoes increased from 5s. to 5s. 6d. per tray; on the Cape Town market from 2s 11d. to 3s. 4d. per tray; and on the Durban market from 1s. 6d. to 3s. 1d. per tray.

Onions.—The supply of onions decreased slightly on most markets and prices increased somewhat. On the Johannesburg market prices of Cape onions, for example, increased from 14s. to 14s. 5d. per bag and on the Cape Town market from 11s. 5d. to 11s. 9d. per bag while local onions on the Durban market increased from 15s. 6d. to 16s. 1d. per bag.

Potatoes.—Still greater quantities of potatoes reached the markets and prices dropped further. Prices of Transvaal potatoes grade I, for example, fell from 12s. 4d. to 10s 1d. per bag on the Johannesburg market; Natal potatoes on the Durban market from 15s. 1d. to 12s. 7d. per bag; and Transvaal potatoes on the Pretoria market from 11s. 8d. to 9s. 9d. per bag.

Vegetables.—Except for Hubbard squashes and pumpkins which were well supplied, vegetable offering decreased sharply on the Johannesburg market, particularly in the case of beetroot, cabbage and green peas. On most of the other markets vegetable offerings were, however, too small to meet the particularly good demand and prices throughout remained high.

* All prices mentioned are averages.

Seeds, Grain and Fodder.—Supplies decreased sharply and prices were firm. Dry beans were more plentiful than dry peas. The other kinds were offered in moderate quantities.

Fodder.—In general the quality was poor, particularly in the case of teff and sweet grass. Good supplies of sweet grass were available and teff was plentiful, particularly during the second half of the month. Lucerne offerings, chiefly from the Cape Province, were in general of poor quality. Lucerne of good quality experienced a strong demand.

Eggs and Poultry.—Eggs were moderately well supplied on the Johannesburg market, but were still fairly scarce on the other markets and generally prices were high. Further increases in the maximum wholesale and retail prices of eggs were announced at the beginning of March. Good supplies of poultry were available on the Johannesburg market, and high prices were realized.

Index of Prices of Field Crops and Pastoral Products.

THE above index, which appears elsewhere in this issue increased from 202 the previous month to 203 in February 1947.

The most important changes occurred in the following groups:—

(a) "Hay" decreased from 144 to 127, particularly as a result of a decrease in lucerne prices.

(b) "Other Field-Crops", i.e. potatoes, onions, sweet-potatoes, and dry beans, decreased from 174 to 157 as a result of a further price decrease, particularly in the case of potatoes.

(c) "Pastoral Products" increased from 178 to 187 due to an increase in the average wool prices.

(d) "Slaughter Stock" decreased from 200 to 191 as a result of the reduction in the seasonal price of slaughtered cattle in controlled areas.

(e) "Poultry and Poultry Products" increased from 238 to 248 in February, particularly due to a further increase in the prices of eggs, fowls and turkeys.

Agricultural Conditions in the Union during February, 1947.

Weather Conditions.—Good showers of rain occurred in many parts of the summer-rainfall area. The rains were, however, widely scattered and were accompanied by hail which caused considerable damage in some places. Soaking showers were, however, necessary over the whole of the Union to see summer cereals and pastures through.

Crops.—Summer cereal crops were still promising. In some areas maize began to suffer from drought and urgently needed rain, particularly in the western Transvaal and the western Orange Free State. Timely showers later in the season will ensure that a good summer cereal crop is harvested.

Stock and Pastures.—As a result of the scattered showers of rain, the condition of stock and pastures varied. In the Karoo farmers suffered stock losses and rain was urgently required for the pastures and water supplies. Except for lumpy skin disease and nagana, which still occurred in Natal, stock diseases were quiet.

Review of the Wool Market during February 1947.

DURING February 1947 a total of 123,450 bales of wool was offered for sale in Union ports, of which 98,820 bales (80 per cent.) were sold.

Competition was keen for wool of good quality, particularly spinning and super wools which were offered in limited quantities. For most types of wool the average prices were higher than those of the previous month.

Fruit Estimates : February 1947.

THE drought still continued in the western Cape Province and was aggravated by abnormal heat conditions which prevailed in nearly all parts of the western Cape.

The Fruit Crop.

Peaches.—With the exception of the last portion of the cling-stone crop, all varieties have already been harvested. Late varieties, particularly Kakamas, are yielding well, but as a result of the drought the fruit is on the small size.

Prunes.—The prune crop, which has almost been harvested, has undoubtedly been the best since 1942.

Pears.—Notwithstanding the drought conditions, it appears that this year's pear crop would be the best in the history of pear growing in the western Cape Province. The crops are not only heavy but are also exceptionally free from codlingmoth infestation. In some areas, particularly the Koo, the fruit is on the small side, but nevertheless still marketable.

Apples.—Good average crops are expected although they will not by any means be as good as those of last year. In the Elgin area, for example, the estimate of the crop is one third that of the previous year.

Grapes.—The drought conditions also began to affect the table grape crop, particularly in the Hex River Valley. In this area the leaves of some vineyards were beginning to wither and fall. It appears that the crop will undoubtedly be poorer than that of the previous year. The quality, moreover, will leave much to be desired.

Diseases and Pests.

Diseases.—The position is exceptionally favourable. Diseases such as Mildew Fusicladium and Anthracnose, which caused considerable damage in some previous seasons, are exceptionally quiet this year.

Pests.—The same applies to insect pests. Reports from the different apple and pear areas indicate that the codling-moth infestation as yet remains small. With the exception of the mealy bug in late grapes in the Hex River Valley, the insect position remains satisfactory.

Maximum Prices of Eggs.

THE maximum wholesale and retail prices of eggs in controlled areas as fixed on 7 February 1947 (See "Crops and Markets" of March 1947) have been increased all round by 3d. per dozen for each grade as from 7 March, 1947, while the maximum price at which eggs may be sold in uncontrolled areas has also been increased by a further 3d. per dozen.

(See Government Gazette Extraordinary of 7 March, 1947.)

Control of Potatoes.

THE present season's crop of summer potatoes is exceptionally large. During the past few months increasing quantities reached the markets and sharp price declines occurred.

In January 1947 the average price of Transvaal No. 1 potatoes on the Johannesburg market was for example, 12s. 4d. per bag (150 lb.) in comparison with 34s. 8d. per bag in January 1946. Similar sharp price decreases occurred on the other markets.

Producers' prices have fallen by more than half the fixed prices. Consumers' prices have fallen much less. The fixed maximum consumers' prices had in view the protection of the consumer, particularly when supplies were limited. Consumers' prices did not, however, decrease in sympathy and in order to assist the consumer and also to encourage larger consumption, the fixed top level prices, including consumers' prices, have been completely withdrawn with effect from 26 February 1947.

In order to exercise a greater measure of control over the potato industry, a Potato Control Board has also been established with power to take certain steps relating to the marketing of potatoes whereby surplus potatoes will be disposed of in the most profitable way. A more stable price will thus be assured to producers.

The Board consists of 12 members of which 7 are producer members (viz. 3 for Transvaal, 2 for the Orange Free State and one each for the Cape Province and Natal), 2 representatives of agents in the controlled areas, 2 representatives of consumers and one a member of the Department of Agriculture.

The Board has the power under the authority of the Minister of Agriculture to purchase such quantities of potatoes of any particular class or grade as it may deem necessary for the purpose of regulating the market, as well as the power to export potatoes.

In order to stabilize the overall price both for export and for potatoes bought by the Board and to meet Administrative expenses, the Board may impose a levy not exceeding a shilling per bag on potatoes sold in the controlled areas.

The levy is payable by a market-master in the case of potatoes sold by a market-master, and, when not sold by a market-master, by the person effecting the sale.

(For full particulars see Government Gazette Extraordinary No. 3770 of 26 February 1947).

Prices of Seed Potatoes.—The maximum prices of seed potatoes as fixed thus far have been discontinued as from 7 March 1947.

Prices of Fresh Milk to Producers.

AVAILABLE figures, given in the table below, indicate that by the end of 1946 prices paid to producers for fresh milk in the main urban centres of the Union were more than double those paid at the beginning of the War. A steady advance, in keeping with the general rise in prices, has taken place throughout the intervening period. During the first few years of hostilities the trade was characterized by a change-over from a period of seasonal surpluses to one of prolonged scarcity, and at the higher prices a ready market was found for fresh milk.

With the exception of the determinations under the short-lived Fresh Milk Scheme of 1940, price changes were at first effected without the intervention of price control. By 1944, however, frequent and confusing reports from all parts of the country of increases in

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consumer prices resulted in action by the Price Controller through the publication of a notice (No. 1299 of August 8th, 1944) of Union-wide application, freezing all fresh-milk prices at the levels ruling during the week ending 7 July of that year. Subsequent increases were granted only on the authority of the Price Control Office. Where the provisions of the notice were repealed and new advances in prices permitted, the Price Controller, until the latter part of 1946, fixed prices in the distributive trade only. Producers prices were subject to voluntary agreements, sanctioned by the Department of Agriculture, between the fresh-milk interests concerned.

Government Notices fixing fresh-milk prices to producers first appeared in November last year, the areas affected being the Cape Peninsula, the Witwatersrand and Pretoria. In the face of abnormal shortages, irregularities which occurred in the buying and selling of milk made these enactments absolutely necessary. Milk sold by producers to distributors in the Port Elizabeth area has since come under similar ruling.

The higher prices now being paid to producers are partly attributable to a phenomenal increase in consumption and partly to the continuous rise in production costs during the period 1939 to 1946. Over the last two years, however, fresh-milk farmers have been confronted with problems which have rendered their task increasingly difficult. Serious droughts, an acute shortage of protein-rich concentrates, which has meant a lowering in quality of dairy rations, and the incidence of lumpy skin disease, especially in Transvaal herds, have all been a threat to the supply position and are the main reasons for the price increases granted in 1946.

Quota Prices of Fresh Milk to Producers.

Year.	Johannesburg.	Cape Town.*	Durban.	Pretoria.	Port Elizabeth.	Bloemfontein.	East London.	Pietermaritzburg.
1937.....	d. 11·0	d. 10·5	d. 8·0	d. —	d. 9·8	d. 10 0	d. 9·6	d. 7·2
1938.....	11·5	11·1	8·0	—	—	9 3	9·6	8·2
1939.....	11·7	10·9	8·0	—	—	—	9·3	7·5
1940.....	12·6	11·3	8·0	—	—	—	9·9	8·5
1941.....	13·8	—	8·9	13·9	—	—	11·1	—
1942.....	17·5	14·7	14·6	16 3	14 2	13·3	13·8	14·3
1943.....	19·5	19·9	19·2	19·0	17 3	15·3	16·4	18·5
1944.....	20·0	20·4	19·0	20·0	18 0	16·0	17·2	19·0
1945.....	20·7	21·0	19·0	20·7	18 0	17·7	19·1	19·0
1946—								
January.....	21·0	21·0	19·0	21·0	18·0	18·0	20·0	19·0
February.....	21·0	21·0	19·0	21·0	20·0	18·0	20·0	19·0
March.....	21·0	24·0	19·0	21·0	20·0	18·0	20·0	19·0
April.....	21·0	24·0	19 0	21·0	20·0	18·0	20·0	19·0
May.....	23·0	24·0	19·0	23·0	20·0	18·0	21·9	19·0
June.....	23·0	24·0	19·0	23 0	20·0	18·7	24·0	19·0
July.....	23·0	24·0	19·0	23·0	20 4	20·0	24·0	19·0
August.....	23·0	24·0	19·0	23·0	22·0	20·0	24·0	19·0
September.....	23·0	24·0	19·0	23·0	22·0	20·0	24·0	19·0
October.....	23·0	24·0	20·0	23·0	22·0	20·0	24·0	20·0
November.....	23·3	24·0	21·0	23·3	22·0	20·0	24·0	21·0
December.....	24·0	24·0	21·0	24·0	22·0	20·0	24·0	21·0

* Until 1944 weighted average of all prices paid to producers. Subsequent prices given are quota prices.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Com- bined index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
WRIGHTS.	19	19	2	8	34	6	17	6	100
1936-39.....	92	109	96	89	79	102	108	94	93
1939-40.....	86	114	77	95	115	105	108	89	104
1940-41.....	103	120	106	156	102	108	110	103	109
1941-42.....	120	144	143	203	102	131	135	186	124
1942-43.....	160	157	144	159	122	147	168	167	147
1943-44.....	170	186	137	212	122	154	165	188	159
1944-45.....	183	186	160	231	122	177	179	184	164
1945-46.....	201	194	164	312	118	193	185	170	170
1946—									
January.....	198	194	191	347	118	204	183	204	174
February.....	198	194	158	305	118	186	184	224	171
March.....	198	194	160	280	118	186	181	241	171
April.....	198	194	176	293	118	186	180	279	174
May.....	249	194	170	284	119	196	177	239	184
June.....	246	194	173	287	119	218	178	260	184
July.....	245	194	182	303	120	231	183	193	182
August.....	242	194	181	319	120	231	183	164	181
September.....	243	194	183	351	163	231	196	156	198
October.....	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December.....	242	210	157	236	168	194	208	201	200
1947—									
January.....	242	210	144	174	178	194	200	238	202
February.....	240	210	127	157	187	194	191	248	203

(a) Maize and kaffircorn.

(d) Potatoes, sweet potatoes, onions and dried beans.

(f) Butterfat, cheese milk and condensing milk.

(e) Wheat, oats and rye.

(e) Wool, mohair, hides and skins.

(g) Cattle, sheep and pigs.

(c) Lucerne and teff hay.

(h) Fowls, turkeys and eggs.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannesburg. Table.	Durban.	Cape Town.
1936-39.....	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40.....	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1940-41.....	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1941-42.....	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1942-43.....	10 6	18 11	10 4	13 10	18 0	14 3	9 10	7 1	8 4
1943-44.....	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1944-45.....	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1945-46.....	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1946—									
January.....	12 9	13 1	9 11	14 8	12 3	13 5	18 2	7 8	14 7
February.....	13 5	13 10	9 9	10 4	12 2	14 0	16 0	8 1	10 8
March.....	13 10	15 2	11 4	14 9	18 9	17 0	12 6	9 6	12 5
April.....	17 8	17 5	14 6	16 9	12 6	17 8	9 11	7 5	9 1
May.....	16 4	17 11	12 0	18 0	19 11	20 10	10 4	7 1	11 4
June.....	20 3	17 11	14 4	18 4	15 4	18 1	9 4	8 2	9 4
July.....	16 7	18 7	15 5	16 8	17 7	20 5	10 4	8 8	12 4
August.....	18 7	18 4	15 7	18 3	16 9	19 4	11 8	8 9	12 1
September.....	16 1	17 7	16 1	19 11	19 3	20 5	15 0	12 11	14 2
October.....	10 3	14 5	12 11	14 8	10 4	15 10	19 0	15 6	17 0
November.....	12 3	9 3	13 0	—	14 3	13 10	19 11	19 1	21 3
December.....	14 8	15 8	15 6	17 10	16 11	15 7	17 1	14 6	17 7
1946—									
January.....	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February.....	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March.....	11 4	12 4	9 9	12 10	12 9	13 5	18 3	14 8	14 8
April.....	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May.....	18 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June.....	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July.....	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August.....	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September.....	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	23 11
October.....	24 9	23 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December.....	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1947—									
January.....	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 3
February.....	14 3	14 5	11 9	13 7	16 1	17 3	16 11	7 6	13 11

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Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johan- nesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.	Johannesburg (a).			
	Cape.	Trans- vaal.				Speckled Sugar.	Cow- peas.	Kid- ney.	
1938-39.....	s. d. 3 10	s. d. 3 1	s. d. 4 0	s. d. 2 7	s. d. 13 1	s. d. 12 9	s. d. 25 0	s. d. 16 9	s. d. 24 2
1939-40.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.....	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.....	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.....	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1946—									
January.....	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February.....	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March.....	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May.....	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June.....	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	71 1	36 6	52 11
1947—									
January.....	5 10	5 11	7 5	3 8	38 9	48 9	61 4	38 11	51 4
February.....	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 3

(a) Municipal Market.

(b) Seasonal year for kaffircorn,
1 June-31 May.

Dry Beans, 1 April-31 March;

Lucerne and teff, 1 July-30
June.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (a).		
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.....	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41.....	1 11	2 9	1 5	2 3	2 4	2 3	5 9	4 11	13 4
1941-42.....	2 7	3 10	2 6	3 11	3 8	3 4	8 5	8 11	17 2
1942-43.....	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1943-44.....	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944-45.....	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1945-46.....	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1946—									
January.....	1 10	0 11	2 4	4 3	1 9	6 7	7 7	3 1	10 2
February.....	1 7	3 4	2 3	5 5	6 9	7 4	7 8	6 11	19 1
March.....	2 3	4 11	2 6	7 7	12 0	6 7	9 5	6 3	25 4
April.....	1 11	2 6	1 10	4 4	6 6	4 0	8 6	13 9	19 6
May.....	3 3	5 3	2 3	5 9	9 11	3 1	9 5	8 7	21 6
June.....	4 3	4 2	3 0	4 9	7 9	8 8	10 0	10 10	13 9
July.....	9 10	7 10	5 10	3 2	11 7	8 8	10 1	16 4	20 11
August.....	7 4	6 4	6 10	5 8	7 10	5 5	13 4	17 11	12 11
September.....	3 1	5 9	4 1	2 8	4 1	2 4	7 5	12 8	16 8
October.....	3 8	5 4	4 9	4 4	3 6	7 7	9 6	9 10	20 11
November.....	1 6	3 4	2 4	9 0	4 0	9 4	9 8	8 8	18 4
December.....	2 4	2 3	2 8	12 1	—	12 5	10 9	7 10	13 10
1946—									
January.....	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February.....	1 11	—	2 3	6 5	—	6 4	7 8	7 11	14 1
March.....	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.....	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May.....	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June.....	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July.....	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
August.....	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.....	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December.....	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January.....	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
February.....	4 2	—	5 1	3 2	12 2	5 8	10 4	—	12 8

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Prices of Avocados and Papaws on Municipal Markets.

SEASON	AVOCADOS (Per Tray). (a)				PAPAWS. (b)					
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Elizabeth Std. Box.	Bloemfontein Std. Box.
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.		
1938-39.....	s. d. 1 6	s. d. 0 11	s. d. 1 3	s. d. 1 11	s. d. 2 0	s. d. 0 10	s. d. 1 7	s. d. 2 0	s. d. 2 0	s. d. 1 8
1939-40.....	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6
1940-41.....	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	1 11	1 9
1941-42.....	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0
1942-43.....	3 1	1 8	2 10	4 8	3 2	1 2	2 1	2 7	1 2	2 0
1943-44.....	4 1	1 6	3 7	5 8	3 2	1 5	2 5	3 5	3 8	2 7
1944-45.....	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0
1945—										
January.....	8 1	1 8	5 10	9 2	8 10	1 6	4 5	7 11	6 4	8 11
February.....	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 6	4 7
March.....	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8
April.....	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6
May.....	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2
June.....	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0
July.....	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11
August.....	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4
September.....	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11
October.....	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10
November.....	8 6	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8
December.....	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6
1947—										
January.....	7 11	—	5 5	—	4 6	1 8	4 10	6 6	8 0	3 9
February.....	2 6	—	2 11	—	4 9	1 5	7 10	—	8 11	—

(a) Season 1 January to 31 December.

(b) Season 1 April to 31 March.

Prices of Bananas and Pineapples on Municipal Markets.

SEASON.	BANANAS (Per Crate) (a)				PINEAPPLES. (b)					
	Cape Town.	Johannesburg.	Pretoria.	Cape Town. Box.	Durban. Doz.	Johannesburg.		Port Elizabeth. Box.	East London. Doz. Large.	Bloemfontein. Bushel Box.
						Ordinary. Doz.	Queens and Glants. Doz.			
1938-39.....	s. d. 22 5	s. d. 9 10	s. d. 16 5	s. d. 5 4	s. d. 3 8	s. d. 1 1	s. d. —	s. d. 3 5	s. d. 1 2	s. d. 4 10
1939-40.....	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
1940-41.....	27 0	7 2	14 8	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941-42.....	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942-43.....	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 8
1943-44.....	37 8	18 2	18 10	8 3	3 6	2 4	2 1	6 8	2 10	8 4
1944-45.....	—	—	—	10 4	3 9	2 6	3 9	7 8	3 8	8 6
1945—										
January.....	31 9	12 11	14 0	7 7	—	1 4	2 2	6 8	2 4	6 3
February.....	32 8	18 5	16 7	5 11	—	1 5	1 3	5 4	2 7	6 11
March.....	27 1	18 7	14 8	6 3	—	1 7	2 5	4 11	4 7	5 6
April.....	34 11	14 10	17 4	7 4	—	2 2	3 5	5 9	2 11	6 4
May.....	30 11	10 8	18 7	8 4	2 9	3 5	2 10	9 4	2 7	8 2
June.....	31 5	9 4	12 6	8 10	2 7	5 4	5 9	10 9	4 4	8 6
July.....	33 11	10 6	19 4	13 2	2 5	7 1	5 6	17 7	3 5	15 3
August.....	38 1	16 1	16 4	12 9	4 1	5 4	5 9	18 8	3 8	18 11
September.....	53 7	20 3	12 1	11 7	8 3	5 9	6 2	10 4	5 0	15 8
October.....	70 8	41 1	33 4	13 1	10 7	7 6	5 8	16 0	4 6	14 1
November.....	68 0	32 4	25 1	10 10	10 9	4 5	5 0	12 4	4 10	13 6
December.....	76 11	17 7	11 1	10 7	7 4	3 4	4 6	7 7	5 9	8 5
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February.....	54 3	12 0	18 8	8 4	2 9	2 8	4 0	8 5	4 6	9 7
March.....	69 7	17 3	23 6	9 10	5 9	3 0	3 8	7 1	6 7	11 6
April.....	75 5	29 5	17 7	11 8	5 7	4 0	5 4	9 5	2 7	9 4
May.....	76 8	29 8	22 2	7 6	4 6	3 4	3 6	8 3	8 10	8 7
June.....	77 11	23 5	28 7	10 7	5 0	4 7	4 7	7 5	6 8	12 3
July.....	60 11	25 4	25 8	15 7	3 2	9 3	10 3	15 5	5 7	13 5
August.....	72 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10
September.....	66 5	20 6	30 8	10 1	7 7	6 5	7 2	12 2	4 7	13 11
October.....	78 10	23 6	34 6	15 5	6 5	6 9	6 5	13 10	4 8	14 5
November.....	68 8	47 0	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11
December.....	67 7	30 7	35 4	16 5	4 5	7 0	—	11 11	4 7	17 8
1947—										
January.....	41 7	20 2	20 4	9 2	5 1	2 3	3 6	6 8	3 6	7 5
February.....	46 0	14 10	15 10	6 10	2 0	2 0	2 7	5 4	3 7	6 8

(a) Season 1 January to 31 December.

(b) Season 1 October to 30 September.

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The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

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- (1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
- (2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
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Inquiries.—All general inquiries in regard to the above should be addressed to the Editor, Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ... AFRICA

VOL. 22

MAY 1947

No. 254

Editorial:

Thorough Soil Cultivation and Increased Food Production.

"PRODUCE more food" is the cry of a hungry world to-day.

We in South Africa must also give ear to this cry, although we are not in immediate proximity to the scene of the worst suffering. Our own demands to-day exceed the supply from our own soil and very little can be expected from overseas. Everyone who is responsible for the production of food must, therefore, endeavour to employ every means of production as effectively as possible. Problems concerning the soil and plant-life have always been and are to-day more than ever the problems of a nation. In the successful solution of this problem lies the promise of food and other essentials for the existence of man.

In the sphere of crop production there is probably no single factor to rival thorough soil cultivation in influencing crop yields. Nevertheless, the yield alone should not be regarded as the criterion in thorough soil cultivation, since the soil-plant relation is ultimately of greater importance. Until recently, considerable attention was devoted to studies of the soil on the one hand, and to plant studies on the other. To a very large extent these two lines of study developed separately.

Our interest lies not only in the yields to be obtained through the application of a certain treatment, but also in the ultimate influence of such treatment on the soil, since there is an interaction between soil and plant which sometimes has far-reaching effects. When the matter is viewed in this light, the question arises as to whether we have actually made very great progress with research into soil cultivation, apart from its influence on increased production as a result of the eradication of weeds and the conservation of moisture.

The latter aspect is of decided importance to the South African farmer, since soil moisture is the limiting factor in crop production in most areas of this country. The precarious nature of our rainfall and the rapid evaporation which takes place under our climatic conditions justify the contention that there is possibly no single factor which can have such a detrimental effect on production as

slip-shod cultivation of the soil. This fact will be more readily appreciated if it is remembered that our principal crops are mesophytes, i.e. plants which require a moderate supply of water, and consequently need all the available soil moisture under our conditions. We must, therefore, conserve in the soil as much water as is possible without detrimental effects, and it is here that efficient cultivation of the soil plays so important a part. The tremendous effect of weed-infestation on production has been proved experimentally in semi-arid parts of the Union. Over a period of three years the uncontrolled growth of weeds reduced the production of maize by 11 bags per morgen, although there were considerably fewer weeds growing on these experimental plots than are usually found in practice in the maize lands of most farms. According to American figures, 271 tons of water are required to produce 1 ton of dry material in maize. The importance of conserving soil moisture by applying proper farming practices is, therefore, obvious.

Thorough cultivation of the soil, together with such supplementary practices as fertilization, the use of suitable varieties and the control of diseases and insect pests, will considerably increase the production of vital crops in this country, especially where, with a view to ensuring greater stability, the soil-plant relation is taken into consideration in the application of these cultivation practices.

(J. C. Erasmus, Lecturer in Field Husbandry, College of Agriculture, Glen.)

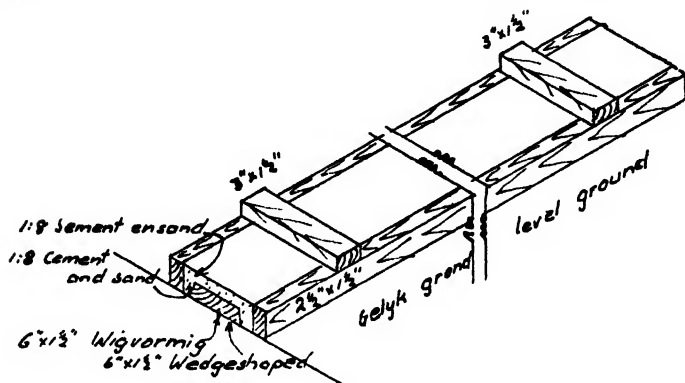
Levelling Outfits for Farmers.

IN order that farmers may help themselves in the surveying of anti-erosion works, the Director of Soil Conservation and Extension has made arrangements for the local manufacture and sale of reliable, but cheap instruments. The outfit consists of a telescopic dumpy level with tripod, levelling staff and instructions. It will be obtainable from the Division of Soil Conservation and Extension, P.O. Box 965, Pretoria, against a remittance of £10, accompanied by a certificate from the local Magistrate or Extension Officer, indicating that the applicant is a *bona fide* farmer.

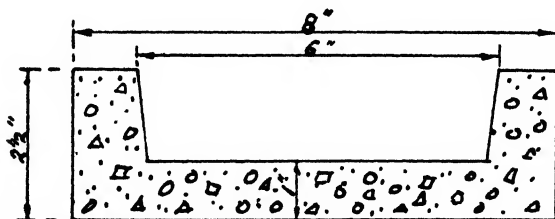
Storage Tank for Maize.

J. A. Vorster, Agricultural Research Institute, University of Pretoria.

SINCE India at present refuses to supply the Union with jute, farmers are experiencing difficulty with the storage of their maize. As a rule the bags are filled as the maize comes out of the threshing machine and are then taken to the grain elevator or to the farmer's shed or store room. With the shortage of jute bags some of the farmer's problems may perhaps be solved by the use of grain tanks.



VORMS OM SEMENT-BLOKKE TE GIET
FORMS FOR THE CASTING OF CEMENT BLOCKS



DEURSNIT DEUR SEMENT-BLOK
SECTION THROUGH CEMENT BLOCK

The question of storage tanks for maize has not yet been solved satisfactorily, however, since there are still many difficulties to be investigated.

The type of tank suitable for the purpose may be constructed of wood, galvanized iron, brick or concrete. Wooden tanks are out of the question in South Africa since timber is scarce and expensive and a good carpenter is required to build this type of tank. Nor are these tanks permanent.

Concrete tanks are uneconomical unless a whole series of the same shape can be built.

Galvanized iron tanks are effective and can be bought ready-made at a cost of about £23 per tank with a capacity for 110 bags. Tanks for 200 bags of maize will cost about £46. If the iron tanks are painted regularly, they last indefinitely. One difficulty attached to the storage of maize in iron tanks is that iron is an excellent conductor of heat.

During the day when the sun shines on the tank the maize against the tank walls is heated and moisture is exuded. At night when the tank cools rapidly, this moisture is condensed against the tank walls, causing the maize to become wet, and eventually the maize against the walls and under the lid becomes mouldy.

This difficulty may be overcome, however, by placing the storage tanks under a shed where they are not exposed to the direct rays of the sun. Mildew will be prevented in this way. The cost of the shed must, however, be added to that of the tank.

On the accompanying diagram full particulars are given for the construction of a brick tank with a concrete roof, with a capacity of 200 bags of maize. The plans were drawn up at the request of a farmer and the writer thought that other farmers might also be interested in this type of tank.

At the prevailing prices it will cost about £60 to build the proposed tank, i.e. if the farmer has to buy all the materials including timber for forms for the roof, sand, stone, etc.

Foundation.

The tank must have a good foundation, since a large portion of the weight of the maize rests directly on the foundation. A foundation of 2 feet by 9 inches on good firm soil and cast from a mixture of 6 parts of broken stone, 3 parts of sharp sand and 1 part of cement will be strong enough.

The floor in the tank should be at least 9 inches above the ground and the tank must not be situated in a hollow where water can dam. In the diagram the top of the floor is about 3 feet above the soil surface, making it possible for a bag to be filled under the outlet pipe. Otherwise the floor may be built lower and a hole made to hold the bag. This method is not recommended, however, since the bag will then have to be lifted from the hole.

The foundation walls up to the floor level should be 9 inches wide and built of bricks. If hard bricks are used, this part need not be plastered.

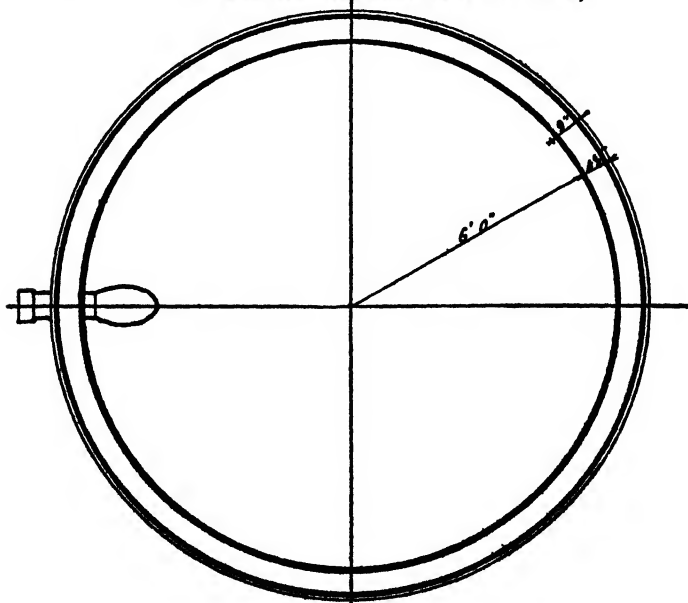
Floor and Outlet Pipe.

The space under the floor is filled up as follows:—A layer of stones followed by a layer of gravel and a layer of sand. This filling will prevent moisture rising from the ground.

Before the floor is cast, a layer of damp-proof coursing is placed on the 9-inch foundation wall. The floor is 4½ inches thick. The lower 4 inches are concrete consisting of 6 parts of broken stone, 4 parts of sand and 1 part of cement. If there is any possibility that the filling under the floor may cave in, the floor must be reinforced as shown on the diagram. If the filling is rammed down very firmly, the floor may be cast without reinforcement. The 4 inch concrete slab is covered with a ½-inch layer of cement topping consisting of 1 part of cement to 3 parts of clean sand.

A hollow is made in the floor, just where the outlet pipe passes through the wall. This outlet pipe has an internal diameter of 6 inches. In order to make it insect-proof, a socket is screwed onto the outside. This socket is covered on the outside with an iron disc welded to it.

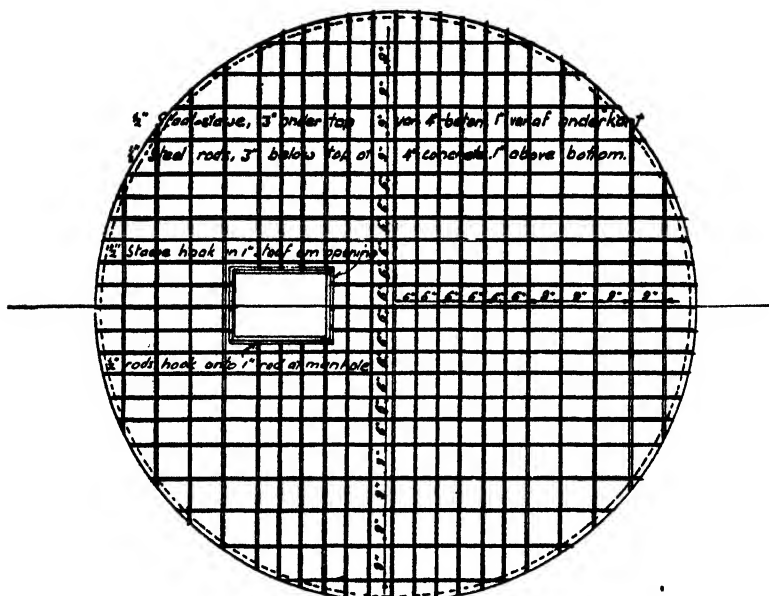
Walls and Reinforcement.

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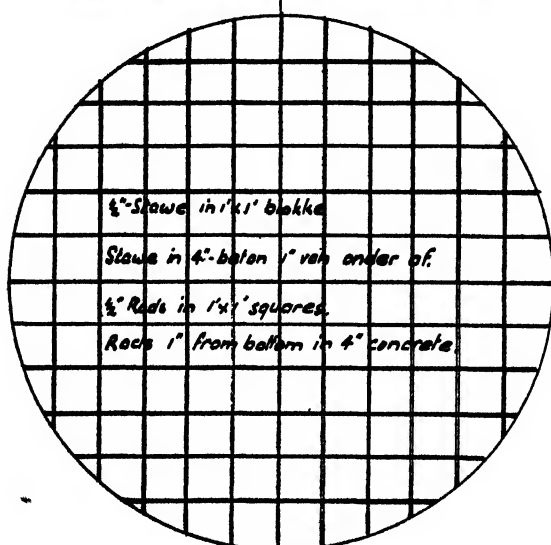
PLAN

reinforcing wires are firmly fastened round the wall after it has been built and before it is plastered.

The wire may be put round in one piece. A peg is fixed at the bottom of the wall and the wire fastened to this. The wire is then strained round and round the tank by three or four men. One man sees that the spacing round the wall is correct, viz., one winding at each of the following heights above floor level: 3 in.; 9 in.;



STAAL-VERSTERKING IN 4"-BETON-DAK
STEEL REINFORCING IN 4" CONC. ROOF



STAAL-VERSTERKING IN VLOER
STEEL REINFORCING IN FLOOR

STORAGE TANK FOR MAIZE.

1 ft. 3 in.; 2 ft. 3 in.; 2 ft. 9 in.; 3 ft. 6 in.; 4 ft. 6 in.; 5 ft. 6 in.; 6 ft. 6 in.; 7 ft. 6 in.; 7 ft. 10 in.; and 7 ft. 11 in.

Roof.

Before the roof is put on, two layers of damp-proof coursing are placed on top of the wall to allow the roof to expand and to shrink. The actual roof is cast from concrete consisting of 4 parts of broken stone, 3 parts of sand and 1 part of cement, and is reinforced as shown in the diagrams.

The shuttering on which the concrete is cast, must be at least $1\frac{1}{2}$ inches thick and must be supported every 2 ft. in the length of the boards. The inexperienced builder may have some difficulty in erecting the shuttering. The roof should extend slightly beyond the wall to form an eave with drip. A ring made from plywood may serve as a form to keep the 4-inch layer of wet concrete on the shuttering and on the wall. The concrete should be firmly rammed down around the previously constructed reinforcing grid.

On the concrete roof a number of cement blocks or strips, channel shaped in section, are placed as shown in the diagram. Cement plaster is worked into the joints between the blocks with a trowel.

The blocks may also be laid in cement plaster. On top the blocks are painted with a thick layer of bitumen paint sprinkled with coarse sand. The bitumen paint is now covered with a top layer of cement plaster consisting of 4 parts of sand and 1 part of cement. The layer is $2\frac{1}{2}$ inches thick in the centre and falls to a thickness of $\frac{1}{2}$ inch at the sides.

The cement blocks serve to insulate the roof against the heat of the sun and the idea is that this insulation will prevent the top maize from becoming mouldy. The brick walls which are plastered on the inside and outside with a mixture of 1 part of cement and 5 parts of sand will insulate the sides. Extra safety will be ensured, however, if the tank is placed in the shade of trees.

The opening of 2 ft. \times 18 inches in the roof must be tightly closed and the best plan is to buy a ready-made manhole cover of the correct size for this opening.

Material.

The following is a list of the materials required and the approximate costs.

	£.	s.	d.
2,500 hard bricks	10	0	0
2 cubic yards 2-inch ring crushed concrete stone (foundations)	1	10	0
3 cubic yards 1-inch crushed concrete stone	2	5	0
450 lb. $\frac{1}{2}$ -inch steel for reinforcement	5	12	6
5 cubic yards concrete sand	2	10	0
1 cubic yard plaster sand	0	10	0
1 cubic yard building sand	0	10	0
17 (180 lb.) bags of cement	6	7	6
$1\frac{1}{2}$ bags of lime	0	10	0
Manhole cover	1	5	0
Galvanized pipe, 2 ft. 6 in. plus socket	0	15	0
$\frac{1}{2}$ roll 2-ply D.P.C.	0	10	0
1 gallon bitumen paint	0	10	0
$\frac{1}{2}$ roll No. 8 wire	1	0	0
Wood for scaffolding and forms, about	7	10	0
Labour, about	18	15	0
TOTAL	£60	0	0

Concentrates for Dairy Cows.

L. J. Veenstra, Superintendent of Dairying.

ALTHOUGH there is no reason at present to fear any shortage of stock-feed during the winter months, it may be pointed out, that concentrates must in any case be used judiciously in order to avoid waste.

The word waste is here used not only in the literal sense, but also to indicate the uneconomic use of concentrates for which the farmer has to pay a high price to-day.

Even in times of plenty, there should be no waste but as is often the case with a farmer who loves his animals, he will feed even those which he knows are unprofitable.

When the total amount of available concentrates is small or limited, however, the position is different.

If the concentrate ration of a high-producing cow is reduced in order to share with the low producers, the production of the herd as a whole will fall. Since a milk shortage is expected during the winter months, the dairy farmer must do all he can to ensure the highest total production of his herd.

Apart for the food needed for maintenance of the body and for repairing the wear and tear which is continually taking place, a dairy cow needs a certain amount of various food constituents from which to produce milk. Under normal conditions the animal can draw sufficient nourishment from the ordinary feed harvested on most farms, such as various types of hay, silage, green winter feed, turnips, pumpkins, etc., to keep in good condition and even to produce a small quantity of milk. During the summer months, cows will be able to yield 20 lb. of milk or more per day without receiving any concentrates, but during winter this will not be the case unless the quality of the roughage is very high, and sufficient quantities are obtainable. For want of hay rich in proteins, such as lucerne or bean hay, or high-protein silage, the milk yield will be very low unless sufficient quantities of concentrates are added.

Concentrates According to Production.

Research workers have determined how much concentrate feed of a certain composition a cow needs to enable her to produce an extra gallon of milk; but it has not yet been possible to determine beforehand whether she *will* be able to yield an extra gallon if she receives these concentrates. The concentrates which one cow utilizes for greater milk production, may be utilized by another to form meat and fat. Since concentrates are expensive and not very plentiful to-day, it is undesirable to use them for turning poor dairy cows into slaughter cows.

In order to obtain the best results, the farmer must know when every cow in his stable reaches the height of economic milk production, beyond which point an increase of concentrates would involve financial loss.

The owner should therefore carefully control the amount of feed given to each cow, and should keep an individual record of their milk production.

Dryland Lucerne in the South-Eastern Orange Free State.

O. S. Heyns, Extension Officer, Zastron.

IN the grain districts of the western Cape Province, the deterioration of lands has become such a serious problem that a crop had to be found which could be used not only for profitable cultivation but also for restoring soil fertility. The solution to the problem was found in the dryland cultivation of lucerne from which the soil profited both physically and chemically. Not only was a higher yield obtained from cereals following on lucerne, but the stimulating effect of lucerne on the soil also lasted longer than that of fertilizer and, in addition, left the soil in a better physical condition.

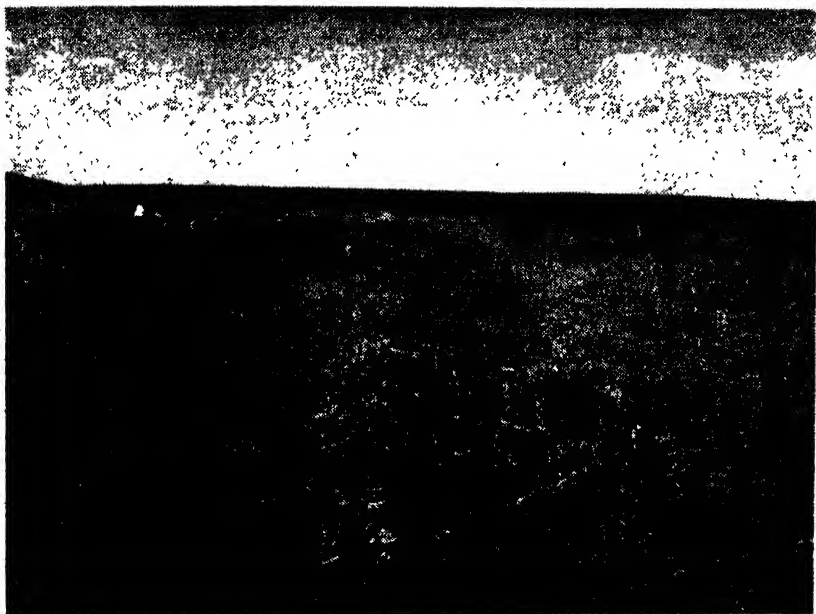


FIG. 1.—Photograph showing flat contour bank, hardly discernible but extremely effective.

Although the soils of the Orange Free State have been under cultivation for a much shorter period than those of the western Cape Province, the continuous cultivation of maize and/or winter cereals without supplementing the reserves of organic matter in the soil and/or cultivating a good resting crop, is causing exhaustion and deterioration of the soil to the same extent as in the western Cape Province. Lucerne can also be cultivated very successfully under dryland conditions in the Orange Free State and therefore offers a solution to this threatening problem of soil exhaustion and deterioration. It would be advisable to check this evil in time by making use of this valuable crop.

In 1944 the Department of Agriculture introduced a lucerne subsidy scheme under which a subsidy of 60 per cent. is paid on

the purchase price of approved lucerne seed, and a special permit granted for super-phosphate. Before a subsidy is granted, the farmer must make formal application, whereupon officers of the Department inspect the soil in order to determine whether it will be suitable for dryland lucerne and in order to advise the farmer in connection with the preparation of the soil, the method of sowing and the management of lucerne in general.

Soil and Fertilization.

The soils of the south-eastern Orange Free State are derived mainly from dolerite and sandstone. As a rule, dolerite soil is a red, clayey loam, containing a considerable admixture of lime, but poor in phosphates. Sandstone soils, on the other hand, are of a sandy loam type, poor in both lime and phosphates. It is clear, therefore, that both these soil types require good phosphatic fertilizer for the successful cultivation of dryland lucerne, and the optimal application should not be less than 400 lb. super-phosphate per morgen. Since phosphates do not move in the soil and since lucerne is a crop with a deep root system, it is essential that the phosphates should be ploughed in deeply before the lucerne is sown.

Since dolerite soils are fairly rich in calcium, they do not require extra fertilization with lime. Sandy soils, however, are acid and poor in lime. For the successful cultivation of lucerne on these sandstone soils, a fairly heavy application of at least two tons of agricultural lime per morgen is absolutely essential. Agricultural lime is the most economical form as well as the cheapest in which lime can be applied. Lime not only neutralizes soil acidity but also stimulates the growth of lucerne and improves its nutritive value and palatability. The agricultural lime should also be applied before the lucerne is sown, and should preferably be ploughed in deeply. On the farm Waterloo in the Zastron district, where a whole-farm demonstration is being carried out, dryland lucerne was sown on sandy soil which had previously received two tons of agricultural lime per morgen. The lucerne showed much better growth at a very early stage and was less severely damaged by frost than other lucerne which did not receive lime.

Preparation of the Soil.

It is advisable to sow dryland lucerne in early autumn, and consequently there is ample opportunity during the previous summer for thorough preparation of the soil. No other crop should be cultivated on the soil shortly before the lucerne is sown. During the previous summer the soil must be ploughed thoroughly, twice if possible, and repeatedly harrowed in order to obtain a fine seedbed and to destroy weeds.

Another important factor in the preparation of the soil is adequate protection against soil erosion. It is clear, of course, that once the lucerne has been established, it is extremely difficult or even impossible to apply soil conservation measures. Although the lucerne will afford adequate protection against soil erosion once it is established, it cannot do this in its early stages, and it is therefore advisable to make contour banks previously in order to protect the crop against heavy downpours, especially on sloping ground (see fig. 1).

Time of Sowing, and Sowing Methods.

As mentioned before, autumn is the best time for sowing lucerne, viz. in March, since the season is then too far advanced for the germination of most weed seeds. The lucerne will, therefore, be able to become well established during the following winter and



FIG. 2.—Lucerne, showing stand obtained with four inches of rain since sowing.

to develop a strong root system. With the first summer rains, the crop will have a good start and be able to oust any weeds. The accompanying photo (fig. 2) taken on 4 January, 1946, shows lucerne planted during the previous autumn. It grew luxuriantly with only four inches of rain since the date of sowing.

The best method of sowing is to use a hand broadcasting machine or a wheelbarrow type of planter. Care should be taken, however, to ensure continuous planting, otherwise bare patches will occur in the stand. Another method is to mix the seed with fertilizer and then sow it through the fertilizer hopper of a wheat planter. See that the fertilizer pipes are lifted out, however, and that the seed is scattered evenly over the ground.

Like all other fine seeds, lucerne seed should be covered lightly, a light harrow or branches tied to a light beam, being used for the purpose. A practical hint for sowing lucerne seed with the hand broadcasting machine is to attach an additional temporary seat to the tractor on which the sower can sit with his back to the tractor. The person operating the hand broadcasting machine broadcasts the seed in the opposite direction to that in which the tractor is moving, scattering it in front of or over the harrow or branches following the tractor. Fig. 3 clearly showing the tracks of the

tractor, illustrates very well that lucerne requires a firm seedbed, because the best stand was obtained in those tracks. This proves the desirability of rolling the land after sowing, and for this purpose a proper roller, if available, is the best implement. Its use ensures close contact between weed and soil and optimal germination. Rolling the land does not form a crust through which the seedlings have to struggle.

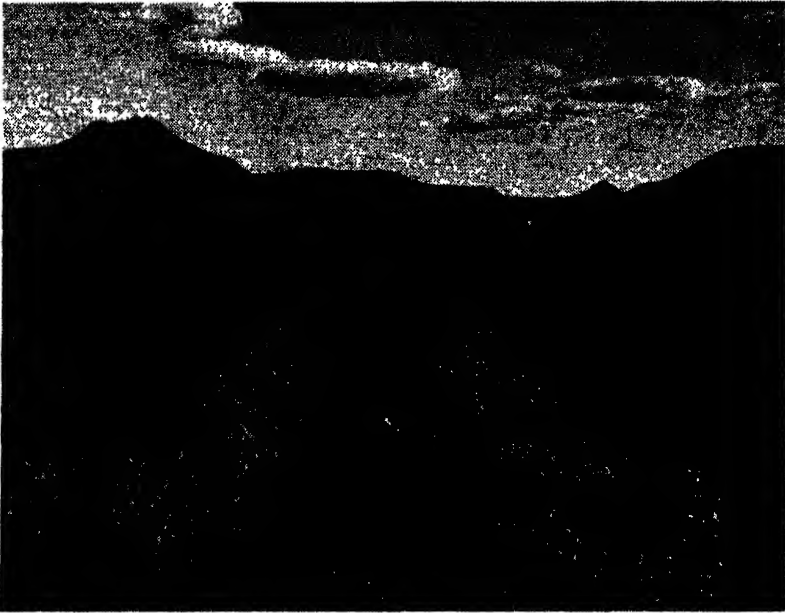


FIG. 3.—Photograph showing better stand on tractor tracks.

In the eastern Free State the rate of seeding is about 30 lb. per morgen and it is usually estimated that a 200 lb. bag of seed will be sufficient for six morgen. Only two varieties are recommended, viz. Hunter's River and Provence, and there is very little difference between the two. In some areas farmers are advised to sow the lucerne together with a winter cereal which serves as a foster crop. In the Orange Free State, however, this practice is definitely not recommended since root competition for moisture may be too strong for the young lucerne during the dry winter months.

Since the Orange Free State is a grass area with no indigenous clover of any kind, the soil contains no nitrogen-fixing bacteria. It is, therefore, essential that the seed should be inoculated beforehand with the necessary nodule-forming bacteria, obtainable from any seed merchant. They are inexpensive and their use is strongly recommended.

Every Merino Sheep is Important.

N. G. Wessels and P. G. Neethling, Sheep and Wool Officers,
Grootfontein College of Agriculture.

FROM a distance any forest usually looks very attractive and uniform, but on closer inspection it becomes clear that the wood is composed of a great variety of trees, some large and others small, some well developed and others stunted and puny.

This is also true of many a flock of merino sheep, which as a flock is not bad and leaves the owner well satisfied with the condition of his animals. On the whole, the wool yield may be good and not below average for the area. Wool prices may be satisfactory, the animals generally of good size and even the lambing percentage of good average.

The flock as a unit can therefore be regarded as quite normal, and even the owner may be satisfied with this state of affairs.

As in the case of a forest, however, closer investigation, especially a comparison of individual sheep, will reveal little uniformity, for scattered amongst the good animals, there will be many extremely inferior individuals. Although the good sheep compensate for the poorer animals and ensure a satisfactory average for the flock, the general level can be raised considerably by means of culling.

Recently the lambing percentage has been generally poor. Fertility is certainly one of the most important factors in successful animal breeding and every farmer knows that he must do everything in his power to secure high lambing percentages. Undoubtedly very few, if any, merino breeders can boast of a lambing percentage of 100, and yet many breeders of British breeds and Blackhead Persians obtain up to 150 lambs per year per 100 ewes.

Even amongst merino ewes there are individuals which lamb regularly each year, and many which produce twins every year.

At the Grootfontein College of Agriculture a unique case was recorded of a merino ewe, D.B. 286, which lambed regularly for 10 successive years and produced a total of 20 lambs, viz. 8 pairs of twins, 1 set of triplets and 1 single lamb. In this same flock, as well as in many others, there are several ewes which have produced 12 and more lambs during a period of 10 years. In a flock consisting of such individuals it will not be difficult to obtain a lamb crop of 100 per cent. or even more. In contrast to these, there is the case of D.B. 919 which lambed for the first time at the age of three years and then skipped two years, before lambing again; and D.B. 924 which was culled from the flock at the age of 5 years because she had not lambed yet.

As regards wool production, there are great individual differences even amongst sheep kept under similar conditions. An average wool production of 9 lb. is regarded as reasonably good for a flock, but in order to attain this average production, some ewes must produce 12 lb. and over, whilst others in the same flock yield only 5 and 6 lb. under the same conditions. Of course, the ewe which lambs regularly cannot be expected to have a high wool production, although there are such cases, such as D.B. 435 which produced 7 lambs over a period of 6 years at the end of which she yielded 7 lb. of scoured long staple medium wool, i.e. 12½ lb. of light greasy wool. There

are many similar ewes in every flock. The low producers not only produce less wool, but in most cases shorter wool, which yields less per pound.

The same wide individual differences are found if other economic factors such as milk production, susceptibility to blow-fly strike, size, etc., are taken into account. In every flock there are ewes which are well able to raise their twin lambs, whereas others, under the same conditions, have not got sufficient milk for one. Some ewes must be regularly treated for blow-fly strike, whereas others are seldom or never attacked.

From the foregoing it is clear that although a farmer can be fairly well satisfied with the average of his flock if regarded superficially, this average may be increased by looking upon his flock as a unit composed of individuals, of which many are far above the average. Each individual must be taken into account, and no farmer should be satisfied with an average. If our breeders could succeed in building up merino flocks composed entirely of outstanding individuals, it will be unnecessary to introduce foreign blood in order to put our sheep-farming industry on a sound and profitable basis; in other words, their future will be assured.

Concentrates for Dairy Cows :—

[Continued from page 418.]

In many stables such records are kept, but in others again the cows are just fed in the hope that they will receive the correct quantity; consequently many dairy cows do not receive sufficient concentrates whereas others receive far too much.

There is a possibility of a future shortage of certain types of concentrates, and prices will rise. Therefore it is now the time for the farmer to inspect his herd. Animals which are unprofitable as dairy cows must be sent to the abattoir as soon as possible.

If this is not done, the farmer must at least see that all unprofitable animals are culled before the winter.

Nursery Quarantines.

The following nursery quarantines were in force on 1 May 1947 :—

Municipal Nursery, St. George's Park, Port Elizabeth, on privets, bay, ekebergias and pecans (all), for red scale.

Ticks and Tick-borne Diseases.

Part II.—Control Measures.*

R. du Toit, Veterinary Research Officer, Onderstepoort.

IN general, all control measures aim at destroying the species of tick to be dealt with at the most vulnerable stage or period of its development. Casual or intermittent feeders whose habit it is to feed at a time when the host is at rest, generally at night, are best attacked when they themselves are resting in their lurking places. Those species which remain attached to their hosts for long periods at a time are best attacked on their hosts, but the host itself will often determine the nature of the treatment to be applied, and it is therefore almost impossible to generalize regarding control measures except in a comparatively few instances.

Control measures may be divided into three main categories, as follows:—

(1) Quarantine or isolation of animals harbouring or suspected of harbouring ticks, with the object of allowing these ticks to complete their engorgement and leave their hosts, thus eliminating the chance of clean animals becoming infected.

(2) Destruction of ticks in places of concealment away from their hosts. This involves the use of insecticidal sprays, fumigation, burning, etc.

(3) Destruction of ticks upon their hosts. This involves dipping, application of insecticides by spraying, hand-dressing, dusting, etc.

Quarantine or Temporary Isolation of Introduced Animals.

This most necessary step, when introducing new animals, is only too often neglected due to lack of provision for suitable quarantine space, casualness, etc., and has led to the introduction of several species of ticks into the Union from overseas and the dissemination over wide areas of species not normally present. Quarantine measures are naturally applicable to all species of ticks, but a few instances may be cited where enormous financial loss may result from failure to observe this fundamental principle with the introduction of animals. The *fowl tick* (*Argas persicus*), although not a permanent parasite in its nymphal and adult stages, remains attached to its host as a larva for periods of up to 10 days, in which stage it is generally transported from place to place. If provision is made to keep introduced fowls in the crates in which they came or some other suitable place for 10 days before allowing them to mix with the rest of the birds on the property, a great deal of economic loss due to spirochaetosis and subsequent labour in eradicating the ticks may be averted. The *spinose ear tick* (*Argas mognini*) owes its introduction from America and subsequent spread in this country to failure to observe precautionary quarantine measures. Although capable of persisting in the ears of stock as larvae and nymphs for very long periods, a comparatively short quarantine period during which the ears should be examined and, if necessary, treated to kill the tick, would eliminate all possibility of introduction of the species. Heartwater in cattle and sheep is frequently introduced on to "clean" farms by means of animals harbouring infected larvae or nymphae of the bont tick,

* See article on Ticks and Tick-borne Diseases in the March, 1947, issue of this Journal.

which, being of small size, are not easily observed. It is frequently not realized that the adults of this tick, which are easily seen, are not a potential source of danger so far as the introduction of the disease is concerned, as the adult females after dropping from the host do not feed again but lay eggs which give rise to uninfected larvae.

Destruction of Ticks away from their Hosts.

This method embodies the principles of burning, disinfestation by spraying, etc., and starvation of the parasites.

The *Argasidae*, which are typically rapid feeders and remain on their hosts for short periods at a time, are best destroyed by burning their places of concealment, if combustible, e.g., old fowl runs, crates, etc., in the case of the fowl tick, packing brushwood against kraal walls, etc., and burning this, in the case of the larvae and adults of the spinose ear tick, or spraying the places of concealment, such as cracks and crevices in walls, with some suitable insecticide, in the case of the human tampan.

Spraying Materials Suitable for Use Against Ticks.

Paraffin soap emulsion.—This spray is cheap, effective and easy to make, and may be prepared as follows:—

Dissolve 1 lb. of cut up yellow soap in 2 gallons hot water. Add with vigorous agitation 2 gallons paraffin until the liquid assumes a white creamy appearance. This forms a stock emulsion which for use is diluted with 6 parts of water. Soft water should be used for preference as hard water tends to cause the emulsion to break up on dilution. This may be overcome to some extent by increasing the amount of soap. The efficacy of this spray is greatly increased if $\frac{1}{4}$ pint of 40 per cent. tobacco extract (nicotine sulphate) is added to the stock emulsion which, upon dilution, gives roughly a 0.05 per cent. solution of nicotine sulphate.

Paradichlorbenzene-paraffin spray.— $1\frac{1}{2}$ lb. paradichlorbenzene dissolved in 1 gallon paraffin has been found to give a spray which is particularly effective against resistant species such as the human tampan in buildings.

Pyrethrum spray.—This consists of the extract of the flowers of the pyrethrum plant dissolved in paraffin and, although a rough extract may be prepared at home, is generally more conveniently bought ready made. Many proprietary preparations are obtainable. This spray is extremely effective against ticks in buildings and other places of concealment.

Carbolic and coal tar derivative sprays.—There are many such sprays on the market, many of which are sold as dips or disinfectants. These are diluted with water according to the directions of the manufacturers and are effective against ticks at the correct concentrations.

Destruction of Ticks upon their Hosts.

Dipping or the immersion of animals in an insecticidal solution is the most widely used method for destruction of ticks on animals. In its wider sense it includes the use of sprays, hand-dressing materials and dusts.

In South Africa arsenic in the form of sodium arsenite, which is a white powder but, in accordance with Government regulations, must be coloured blue to avoid confusion with other white substances,

is generally used in a watery solution for dipping purposes. Although in itself an extremely poisonous substance, it is used with impunity if the recommended dilutions and instructions for its use are complied with. For the destruction of the different species of ticks different dilutions and different intervals at which animals should be dipped are prescribed, these being based upon the periods the particular species of tick remains upon its host.

In practice only 7 and 14-day-interval dipping is adhered to these days, the 7-day period being designed for all two and three-host species such as the red tick, bont-legged tick, the brown ticks and the bont tick, and the 14-day interval for the single host species, such as the blue tick and Argentine tick. The 7-day-interval dip contains 0.16 per cent. arsenic (As_2O_3) or 2 lb. sodium arsenite per 100 gallons of water, and the 14-day-interval dip 0.24 per cent. arsenic (As_2O_3) or 3 lb. sodium arsenite per 100 gallons of water. Previously a 3-day-interval dip containing 0.08 per cent. As_2O_3 or 1 lb. sodium arsenite per 100 gallons of water was prescribed for the control of the brown tick, principally in the case of outbreaks of East Coast Fever, as the immature stages of this species may complete their engorgement upon cattle within 3 to 4 days. It has been found in practice, however, that dipping cattle at 5-day intervals in a 7-day-strength dip (0.16 per cent. As_2O_3) gives better results as the 3-day strength is rather too low to be really effective and 3-day-interval dipping has been discontinued. For convenience sake, dipping is generally carried out at intervals of 5, 5 and 4 days until the mortality due to East Coast Fever ceases. By this method every third dipping falls on the same day of the week as that commenced with.

As there is a general tendency to slacken off with dipping during the colder winter months, when tick life is at a low ebb, the most generally employed 7-day-strength dip may be applied with advantage at 14-day intervals during these months to control most tick species. In no case, however, should the strength of the dip exceed 0.24 per cent. As_2O_3 as the risk of scalding animals and poisoning becomes greatly increased.

It is unnecessary here to enlarge upon the practice of dipping, which has been fully dealt with in many departmental publications, but it cannot be over-emphasized that arsenic is an extremely poisonous substance and such precautions as (1) the watering of stock prior to dipping to minimize the danger of cattle drinking dipping fluid, (2) the provision of a well fenced-off area adjacent to the dipping tank into which the dipping fluid may be poured when cleaning the tank becomes necessary, and (3) the proper disposal of all containers in which arsenic was stored, are essentials which, if strictly adhered to, would do much towards reducing the appalling mortality in livestock due to arsenical poisoning which occurs annually in South Africa.

Proprietary Dips.—There are a large number of proprietary arsenical dips available, which contain arsenite of soda in dissolved form as the active ingredient. The usual concentration of sodium arsenite in such dips is 64 per cent. which, upon dilution at 1:800, 1:400 and 1:267 give the final concentrations for 3, 5-7 and 14-day dipping, which are prescribed by Government Notice. In a few instances where the sodium arsenite concentration is below 64 per cent. the makers' directions for dilution should be followed and these are such as to conform to the standards laid down.

Changes in the tank fluid.—The first consideration in the dipping of stock in sodium arsenite solutions is to maintain the dip at the correct strength. Overstrength dip is liable to scald animals, whereas, if the solution is understrength, it will fail to achieve the results desired. Under field conditions a number of factors operate which may be responsible for changes in the tank strength, e.g.:—

(a) Entry of water into the tank from rain, storm water, leaky taps, etc., will dilute the dip and reduce the concentration of sodium arsenite.

(b) Evaporation from the surface will increase the concentration.

(c) Chemical changes in the tank itself will either increase or, more frequently, reduce the apparent concentration of arsenite present.

Chemical changes in arsenical dips are brought about by micro-organisms which are capable of either "oxidising" the arsenite to arsenate or bringing about the reverse change and "reducing" the arsenate to arsenite. In this way it is frequently observed, especially in dips which are seldom used or in which a few head of cattle only are dipped, that the concentration apparently decreases upon applying the usual test, which determines sodium arsenite only. If more sodium arsenite is added from time to time, to adjust this apparent understrength, severe scalding of stock may result, and when a test for *total arsenic* (i.e. arsenic present both as arsenite and arsenate) is made it is found that the tank is overstrength. The reverse is sometimes experienced when dipping is resumed after a period of idleness, such as after the winter, and, although the tank strength may have been adjusted at the recommencement of dipping, it is found to be considerably overstrength some weeks later without the addition of more sodium arsenite. The former change is due to the absence of a sufficient amount of organic matter in the tank, with the result that those organisms responsible for oxidation gain the upper hand, and may be remedied by the addition of a quantity of fresh cattle dung. In the latter case a portion of the tank fluid must be removed and water added to adjust the concentration of sodium arsenite.

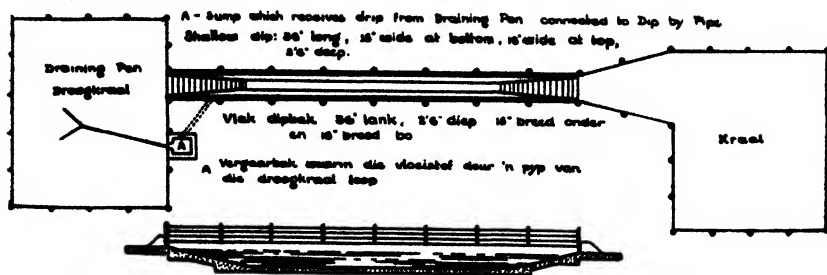
Testing of the dip.—Dips should be tested at regular intervals to ensure that the correct concentration of sodium arsenite is maintained and for this purpose the Laboratory Dip Testing Outfit has been designed which is capable of testing either for sodium arsenite concentration or for total arsenic—the difference between the two readings giving the amount of arsenic present as arsenate in the tank. This outfit, together with full instructions, is obtainable from the Director of Veterinary Services, P.O. Onderstepoort.

The Foot-Dipping Tank.

A modification of the usual cattle types of dipping tank has been designed for use with sheep, which are infested with ticks, especially the paralysis tick. The accompanying sketch, gives details of the construction of the foot bath, which permits of sheep walking through it and thus covering the legs and undersurfaces of the body with the dip to destroy the ticks which occur in these situations. As previously pointed out, the paralysis tick occurs mostly in winter, when it is not advisable to

TICKS AND TICK-BORNE DISEASES.

immerse sheep entirely in any dip. The usual 7-day concentration of sodium arsenite, run into the tank to a depth of 16 inches, is recommended for use with the foot bath.



The foot-dipping tank.

Spraying and Hand-dressing.

When a small number of animals only are to be treated for ticks and dipping is not practical, spraying with arsenical solutions at the above concentrations may be employed. The addition of nicotine sulphate (tobacco extract) to give a concentration of 0.04 per cent. greatly increases the efficiency of such sprays. If the 40 per cent. extract is employed 1 gallon to every 1,000 gallons dip or, in smaller quantities, 4.5 cc. or roughly $1\frac{1}{2}$ teaspoonfuls per gallon, makes a solution of the correct strength. It frequently happens that due to fatty secretions and the inaccessibility of the parts, the dip does not penetrate and thoroughly wet the skin under the tail, in the brush or the inside of the ears, and in these situations it is necessary to apply hand-dressing materials. The following hand-dressing materials, which may be prepared at home, are recommended:—

Axle grease, 10 lb.; Stockholm tar, $\frac{1}{2}$ lb.; arsenical dip containing 64 per cent. As_2O_3 , 1 tablespoonful or $\frac{1}{2}$ fluid ounce; 40 per cent. tobacco extract, 3 tablespoonfuls, or $1\frac{1}{2}$ fluid ounces.

The arsenical dip and the tobacco extract should firstly be well mixed with the Stockholm tar and this mixture then stirred into the axle grease. This mixture is black in colour and somewhat dirty to use. If a cleaner material is required, e.g., for dairy cows, the axle grease and Stockholm tar may be replaced by the following: Water, 1 gallon; yellow soap, 1 lb.; suet fat, $\frac{1}{2}$ lb.

Dissolve the soap (cut up into small pieces) in the water by heating and stir in the suet (previously melted) until the mixture becomes creamy. Allow to cool and stir in the other ingredients.

An effective hand-dressing preparation may be made by stirring into axle grease or vaseline a concentrated extract of pyrethrum. If the usual 2.5 per cent. extract is employed this is used in the proportion of 1 part to 15 or 20 parts grease.

In the case of the spinose ear tick the following mixture, which should be used only in the ears, as it is too irritating on other parts, has been found to give satisfactory results: Oil (old motor oil or cotton seed oil), 2 parts; Stockholm tar, 2 parts; turpentine, 1 part.

Table showing the more important South African ticks, together with the points of chief economic importance attaching to each, and indicating the control measures advocated.

Family or Group.	Tick Species.	Number of Hosts.	Disease Transmitted.	Parasite.	Disease occurs in	Control of ticks on domestic animals.
<i>Argasidae</i>	Fowl tamarin. (<i>Argas persicus</i>).....	Many	Spirochaetosis. Aegyptianellosis.....	<i>Spirochaeta anserina</i> <i>Aegyptianella pullorum</i> ...	Poultry... Poultry.....	10-day quarantine and disinfection of premises.
	Spinose ear-tick. (<i>Argas musini</i>).....	1	NIL	NIL	Cattle, sheep, horses, dogs, man, etc.	Treatment of ears and disinfection of premises.
	Human or eyeless tamarin (<i>Argas moubata</i>).....	Many	Relapsing fever..... Spirochaetosis.....	<i>Spirochaeta duttoni</i> <i>Spirochaeta anserina</i>	Man..... Poultry.....	Disinfection of premises.
	Sheep paralysis tick.... (<i>Ixodes pulex</i>).....	3	Paralysis.....	—	Sheep and goats.....	Foot bath.
<i>Ixodidae</i>	Bont-legged tick..... (<i>Hyalomma aegyptium</i> var. <i>imbricatum</i>).....	2 or 3	Tick-bite fever.....	<i>Rickettsia</i> sp.....	Man.....	7-day dipping.
	Dog tick. (<i>Hemaphysalis leachi</i>).....	3	Biliary fever..... Tick-bite fever.....	<i>Piroplasma canis</i> <i>Rickettsia</i> sp.....	Dogs..... Man.....	Hand-dressing.
	Blue tick..... (<i>Boophilus decoloratus</i>).....	1	Redwater..... Gall sickness..... Tick-bite fever..... Spirochaetosis.....	<i>Piroplasma bigeminum</i> <i>Anaplasma marginale</i> <i>Rickettsia</i> sp..... <i>Spirochaeta theileri</i>	Cattle..... Cattle..... Man..... Horses, sheep, cattle, goats.....	14-day dipping.
	Red tick..... (<i>Rhipicephalus evertsi</i>).....	2	Redwater..... East Coast fever..... Mild gall sickness..... Biliary fever..... Spirochaetosis.....	<i>Piroplasma bigeminum</i> <i>Theileria parva</i> <i>Theileria mutans</i> <i>Nuttallia equi</i> <i>Spirochaeta theileri</i>	Cattle..... Cattle..... Cattle..... Horses..... Cattle, horses, etc.....	7-day dipping.
	Brown tick..... (<i>Rhipicephalus appendiculatus</i>).....	3	East Coast fever..... Mild gall sickness..... Redwater..... Nairobi sheep disease..... Louping ill..... Tick-bite fever.....	<i>Theileria parva</i> <i>Theileria mutans</i> <i>Piroplasma bigeminum</i> <i>Ultraviable virus</i> <i>Rickettsia</i> sp.....	Cattle..... Cattle..... Cattle..... Sheep and goats..... Sheep, horses and cattle Man.....	5 to 7-day dipping.
	Black-pitted tick..... (<i>Rhipicephalus simus</i>).....	3	East Coast fever..... Gall sickness.....	<i>Theileria parva</i> <i>Anaplasma marginale</i>	Cattle..... Cattle.....	5 to 7-day dipping.
	Tropical dog tick..... (<i>Rhipicephalus sanguineus</i>).....	3	Biliary fever..... Gall sickness..... Rickettsiosis..... Tick-bite fever.....	<i>Piroplasma canis</i> <i>Anaplasma marginale</i> <i>Rickettsia</i> sp..... <i>Rickettsia</i> sp..... <i>Hepatozoon canis</i>	Dogs..... Cattle..... Dogs..... Man..... Dogs.....	5 to 7-day dipping, hand-dressing.
	Bont tick..... (<i>Amblyomma hebraeum</i>).....	3	Heartwater..... Tick-bite fever.....	<i>Rickettsia rumicantium</i> <i>Rickettsia</i> sp.....	Cattle, sheep, goats..... Man.....	5 to 7-day dipping.

TICKS AND TICK-BORNE DISEASES.

The New Synthetic Insecticides as Tick-Destroying Agents.

The appearance during the war years of several synthetic insecticides amongst which the para-para isomer of D.D.T. (dichlorodiphenyl-trichlorethane) and the gamma isomer of 666 (benzene hexachloride) have been given the greatest prominence, has aroused considerable interest in the possible use of these substances for the control of ticks. A period of several years, during which their use under varying conditions is closely studied, will, however, probably have to elapse before any final conclusions can be arrived at.

As both these substances are insoluble in water, their incorporation into dipping tanks presents certain difficulties. Tests under field conditions, in which they are being used for dipping purposes either in emulsion form or in fine particle form suspended in water, have yielded promising results to date. The question of their permanence or lasting properties is being investigated, but more time is required before any authoritative statement can be issued and final recommendations made regarding their use as dips.

As sprays on animals for the control of ticks where freshly prepared emulsions or suspensions are employed, the results obtained appear to justify their recommendation for this purpose. D.D.T. is best employed in emulsion form at a final dilution of 2 per cent. or even 1 per cent. of the para-para isomer. Several such concentrated emulsions or water-miscible oils are obtainable which may be diluted or emulsified with water to give the final concentration required. 666 may be similarly employed at a final concentration of 0.02 per cent. to 0.01 per cent. of the gamma isomer. The concentrations suggested are tentative at this stage, but as further information regarding their use is accumulated recommendations will be made in Departmental publications.

In conclusion it should again be emphasized that although the methodical and continued application of the measures recommended by the Department of Agriculture for the control of ticks may to many appear tedious, the labour involved will be amply repaid in the form of increased yields from livestock.

New Bulletins.

The undermentioned Bulletin has recently been published:—

No. 249. Winter Pruning and Trellising of Vines. Price 3d.

✓ A Brief Review of Rinderpest in Africa.

R. A. Alexander, Division of Veterinary Services.

HISTORY shows that one of the aftermaths of war is the spread of infectious diseases. Of the diseases of cattle, rinderpest is one which has consistently taken a heavy toll. Fortunately science has been responsible for the development of methods of control which have materially reduced losses when efficiently applied. The war through which the world has just passed, has been no exception. Rinderpest has broken out in Greece and in Egypt, but in the case of Egypt facilities were available to bring it under control.

In the Central African states, notably Tanganyika and Kenya, rinderpest is always present in cattle or game or both. Due to their uncontrolled movement, game are chiefly responsible for the continued spread of the disease, and care must always be taken that the disease does not spread to the more thickly populated areas to the south. Although it is the aim of the responsible authorities to eliminate all infection from Central Africa, the central railway line to Dar-es-Salaam is regarded as the southern boundary below which infection must not be allowed to spread. When the disease crossed this boundary in 1939, the Southern African states (Union of S.A., S. Rhodesia, N. Rhodesia and Nyasaland) after consultation agreed to assist the Tanganyika authorities, both financially and by the provision of equipment and trained staff, to stamp out infection and drive it north beyond the railway line. Full details of the technical aspect of the work carried out by the unit provided by the Union Veterinary Department will be found in various articles published in the Onderstepoort Journal. The campaign was a success. The disease was driven back a total distance of some 300 miles and during the past 18 months only one minor outbreak, easily controlled, has occurred south of the railway line.

To obviate any possibility of a future spread to the south, not only has a belt of immunized cattle been maintained right across Tanganyika, but a game fence, supported by a trench to exclude wild pigs, was also erected between Lake Tanganyika and Lake Nyasa. In addition, a 20 mile wide game-free zone was maintained north of this barrier. Recently, however, it was decided that conditions had so improved that these extreme precautions could be relaxed. The game fence which has been allowed to fall into disrepair, is being maintained along the northern inter-territorial border of Northern Rhodesia. Nyasaland has undertaken to provide this service from her own resources. Along the rest of the border a special game intelligence service will be maintained to keep a close watch on the game, their movements and any disease that may appear. Towards the cost of this service the Union has agreed to contribute 5/10ths, Southern Rhodesia 3/10ths and Northern Rhodesia 2/10ths. In addition, each state is expected to honour its obligation to control and, if possible, to suppress any disease within its own boundaries. By these measures it is expected that rinderpest will be kept within bounds. At least the southern states will receive timely warning of the approach of rinderpest, when other and more energetic measures will have to be brought into operation immediately. This is a responsibility which the Veterinary Department must be prepared to shoulder at any time and at a moment's notice.

Yema Graft of the Vine.

M. S. le Roux, Western Province Fruit Research Station, Stellenbosch.

BUDDING is a well-known practice in South Africa in the propagation of fruit trees and shrubs, such as citrus trees and rosebushes, but it has seldom been applied to the vine in this country. In California, Australia and parts of Europe, however,



FIG. 1.—This uniform young vineyard on sandy soil at Bien Donn , was budded during February, 1945, onto rootstocks which had been transplanted seven months previously. Eighty-four per cent. of the buds became firmly established and sprouted during the spring of 1946. The remaining vines, as well as the small number which were too weak to bud, were grafted in the soil during that spring.

it has gained considerable acceptance (1) and (2).

The budding of vines, or "yema" grafting, had its origin in Spain. The word "yema" means "bud" or "germ". The technique described here differs slightly from the Spanish method and also from the method of budding applied to fruit trees. The technique which was applied with some success on the experiment farm Bien Donn , is based on data furnished by a prisoner of war who came from an experimental farm near Rome.

Method of Budding.

Time.—As in the case of fruit trees, the vine is budded towards the end of summer, i.e. round about February. It is done at this time of the year to enable the bud to become firmly established during the rest of the summer without developing any further. If the budding is carried out too early during the season, the wood used will not be ripe and the budding will be a failure; if, on the other hand, budding is carried out too late, there will not be sufficient sap in the plant to enable the bud to grow firmly into the wood. The result will be a poor union or otherwise the bud will rot and die during the winter under the heap of clammy soil. In practice, the

best time to begin budding is as soon as shoots with a brown, hard rind are obtainable. Naturally, the exact date will vary according to the variety and the season.

Technique.—This is schematically explained in Fig. 2. The buds are cut from budwood which is considerably thinner than the rootstock to which they are to be grafted, since they fit better then. Good, ripe lateral shoots are best for this purpose and the buds are

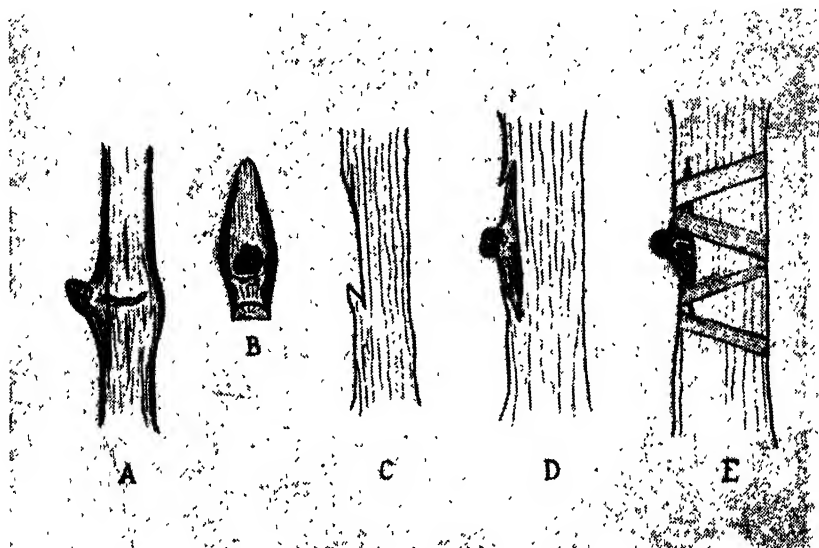


FIG. 2.—Representation of the process of budding: A, cultured shoot; B, shield with bud; C, the incision in the rootstock with flap on the upper side; D, the bud is inserted from the side (E), and securely tied with raffia.

carefully removed with a sharp knife. The knife must not tear into the wood. Only two incisions are necessary, viz. a vertical incision through the internode behind the bud and a short, horizontal incision below the bud to loosen it from the shoot (Fig. 2 A). In this manner a bud is obtained on a small and very thin shield of bark and wood (much thinner than the original Spanish "yema" graft) (Fig. 2 B.) When this has been done, the shield is less than an inch in length and only approximately one-eighth to three-sixteenths of an inch thick. The remains of the leafstalk on the bud are now carefully cut away.

A large number of these buds are cut in this manner somewhere in the shade of a vine and kept in damp cloths, since they easily dry out during this time of the year. The vines onto which the buds are grafted are rooted stocks which were planted out during the previous winter and have therefore been standing for only about seven months. Weak shoots are better left alone and grafted at a later date.

First of all the vines which are to be budded are opened slightly with a spade in order to facilitate the work. Budding is performed at the same height as grafting, i.e. about one or two inches above the soil surface. As a rule it is performed on that side of the vine containing the most shoots, since the flow of sap is stronger and the wood healthier in that portion. If any shoots are in the way, they

YEMA GRAFT OF THE VINE.

are cut off. One-third or more of the growth of the tips of the shoots is also cut away in order to supply the budwood with more sap so that the bud can become firmly attached.

The opening in the rootstock into which the bud must be inserted, is made in the original wood of the young rootstock. For this purpose, three incisions must be made, viz. two downward incisions, a short and a long one on any spot on the shoot, and then a shallow incision across the top (Fig. 2 C). Now a bud which will fit well is selected and inserted from the side so that it is firmly attached to the rootstock (Fig. 2 D). As in the case of grafting, it is extremely important here too that the cambium layer between the wood and the rind must stay in close contact with the cambium of the rootstock on at least one side. In order to ensure that this happens, the budwood is secured with raffia (Fig. 2 E.)

Now a strip of ordinary paper which is reasonably strong, is wound around the union. The paper is secured just above the bud by means of a single odd piece of raffia, so that it cannot shift. The bud and the bottom portions of the shoots are covered with a heap of damp soil approximately one foot high. The paper keeps the sand out of the union and the heap of soil protects the bud against drying out.

It is estimated that a trained person, working alone, can bud approximately four hundred vines per day.



FIG. 3.—Ordinary soil grafting often results in poor unions, such as 1, 2 and 3 above. (In 1, the rootstock has completely vanished.) The nutrition of the vine is hampered by the imperfect graft union and its life is shortened.

Subsequent Care.

It is important that the vines should not be irrigated for the following three weeks, since too much moisture hampers the formation of wound tissue or callus.

After a month has elapsed, the vines are examined. As a rule, the raffia rots away of its own accord, but if it becomes too tight around the vine, it may eventually have to be removed. Early in

spring, before it becomes too hot, the buds are opened and inspected. Those which have become firmly attached can hardly be moved with the fingers. If the union has been successful, the vine is cut about two inches above the bud, since allowance must be made for a certain amount of dying-back in the healthy wood.



FIG. 4.—One of the Waltham Cross vines on Richter 99 vines in Fig. 1, seen at closer range. Note the healthy union obtained by budding.

The vine must be supported immediately and all superfluous wild shoots must regularly be cut away. In this manner all the sap is concentrated in the grafted bud. As soon as the weather becomes warmer, the bud develops so rapidly that it is a pleasure to watch its growth. In trellised vines the young growth soon reaches the wires, and the farmer must keep a watchful eye over the vigorous shoot and fasten it with raffia in order to prevent it from being blown about.

The shoots on which the buds have not grown securely, or which were too thin for budding, are topworked in the normal way by cleft grafting or tongue grafting, during the following spring.

In this manner a strong, vigorous and uniform vineyard with healthy unions is obtained.

Disadvantages of Budding.

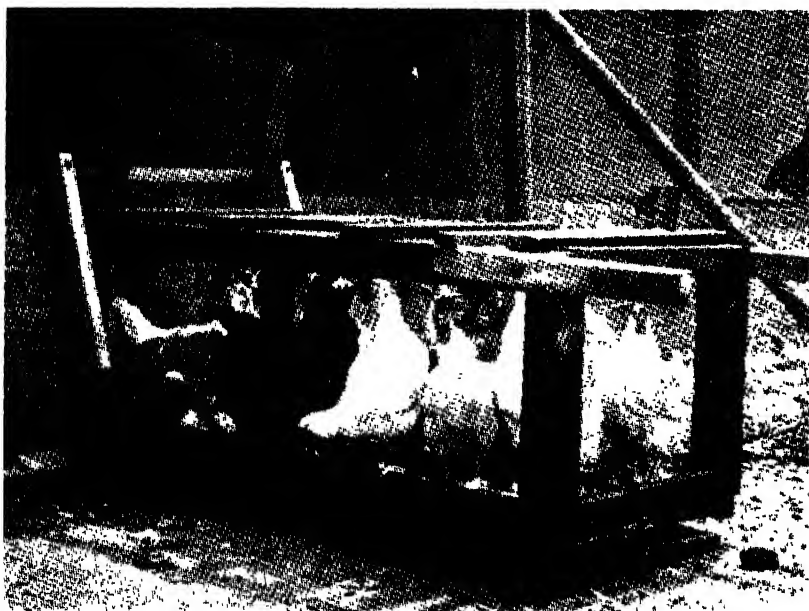
(1) Generally speaking, hand grafting is satisfactory. The farmer buys the ready-grafted vines from the nurseryman. Actually, he need have no knowledge of propagation, or spend any

Hints on Poultry Farming.

I. Factors in the Lay-out of a Poultry Farm.

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THERE are a number of important factors that must be carefully considered in the planning and lay-out of a poultry farm. In selecting the site, preference should be given to ground that slopes east or north-east, as such ground usually is well drained, and also dries off more quickly after rain than ground sloping in any other direction. A site that is level, or one that slopes towards the west, should be avoided, as the former lacks proper drainage and causes serious trouble due to dampness in the houses and runs, while the



Catching crate for handling hens.

latter will not receive much benefit from the morning sun, which is a very important factor, particularly during the winter months. A light sandy soil should be favoured, and, if at all possible, heavy and clayey soils which have slow drainage, should be avoided.

Since it is necessary to perform the daily routine work with the highest degree of efficiency and economy, the various buildings and runs should be so arranged as to make this possible. Where practicable, suitable labour-saving appliances should be employed. Doors and gates should be fitted with fasteners that secure them safely and are easily manipulated. For economy in labour it is necessary to provide food containers of such capacity that they need refilling only once or twice a week. A further advantage is to lay the water on in pipes to each group of birds, or otherwise, if that is not possible, to a few central points in the plant. All food and water containers, perches and nesting boxes must be portable to facilitate their quick removal and replacement for cleaning and repairs.

Since it is necessary, during the hatching and chicken season, to visit the incubator and the brooder houses frequently by day, and sometimes at night, these should be situated near the home. Discretion must, however, be used in the location of the chicken house and runs, because if these are too close to the home, the odours that may arise from them, may be objectionable. To rear chickens most successfully, there must be two separate systems of accommodation for them. For the first five to seven weeks of their life they are accommodated in a chicken house provided with small runs and furnished with some system of warm brooding. From there they are transferred either to colony houses on range, or to adult laying houses that have been prepared for their reception. In the latter event it is a great advantage to provide each house with two runs of fair dimensions. In this way the birds are kept on clean ground in one of the runs, while the other is cultivated to a crop to become clean again.

Where the laying birds have to be kept either on the intensive or the semi-intensive system, the long continuous type of house should be used. Such a house is most economically built with a depth of 18 feet, and, for convenience, should not exceed approximately 230 feet in length. Suitable heights are from 8 to 9 feet in front and 6 feet at the back. Allowing a floor area of 4 sq. feet per bird, the structure is divided with solid partitions into apartments, each to accommodate 150 hens. Such a house will take about 1,000 laying birds. If a larger flock is to be kept, another one or more houses may be erected parallel to and in line with it, allowing a vacant space of about 40 feet between the front of the one and the back of the other. This space is necessary to permit uninterrupted sunshine and ventilation into the houses and also to provide room for runs should these be required.

A room in which to mix and store feed should be erected at the most convenient spot from where the feed can be conveyed over the shortest possible distances to the various groups of birds. There is no advantage in having this room in the middle of a long laying house or the laying plant. In fact, such an arrangement is undesirable, as considerable disturbance of the birds results from the passing of vehicles and their attendants who periodically have to replenish the feed supplies. The egg room should be near the home and, for economy and coolness, may be added to the incubator room, the two apartments coming under one roof. Very careful attention to detail should be paid in the construction of these apartments in order to ensure suitable ventilation and an even temperature.

If small group matings of the breeding stock are not necessary, one or more sections in the laying houses may be used for large flock matings. Should the smaller group mating system be desired, the houses and runs are best situated behind the first row of laying houses. This will prevent disturbance and excitement of the laying flock. This section of the plant should be arranged systematically by placing the houses and runs in line and closing the dividing fences to a height of about 3 feet with some suitable material that will prevent the males fighting one another through the fences. The size of these houses will, of course, depend upon the number of birds they have to accommodate, but should in any case be large enough and be properly furnished to provide the maximum of comfort to their inmates. Since breeding birds occupy their quarters for only a few months in the year, the runs to these houses need not be large. If the double-run system is employed, these houses can, when vacated

HINTS ON POULTRY FARMING.

by the breeding birds, be profitably used to accommodate cocks and cockerels that may have to be kept for future breeding. When chickens have to leave the brooder accommodation, whether they are put out in colony houses on free range or on the semi-intensive system, this department of the poultry farm should be situated on ground lying higher than that occupied by the adult flock. To prevent the birds in their wanderings from finding their way into the adult plant where they may pick up infection, the site for their occupation should be an adequate distance away. When chickens are transferred to a section of the laying houses, the section affording the highest-lying ground should be favoured.

A place of isolation, or hospital, is needed on every poultry farm and, to prevent infection spreading, should be situated at a safe distance from all the other departments. Although it may be of moderate dimensions, provision must be made to accommodate the inmates separately. If a shed is required in which to store vehicles and implements, it should be situated where the removal and replacement of these articles will not cause disturbance to the birds.

The most important factors in the construction of poultry plant are the suitability of the materials used and their economical use. The materials should be selected to ensure strength and durability of the finished buildings against wind and hail, to provide good cover from rain, and to offer the minimum harbouring place for parasites. All wood-work should be free of bark and be thoroughly treated with an insect-repellent fluid, of which there are several excellent preparations on the market. It is best to cover the floors with cement or some similar impervious material. Dressing the walls of the houses, inside and outside, with a mixture of lime and salt prepared to the consistency of cream not only improves the appearance of the buildings, but also closes cracks and small holes in which insects may harbour.

Belts of trees, of one or more varieties that are suited to the locality, should be planted where necessary to serve as wind-breaks to the plant and the birds. Trees should also be planted, for shade, in exposed runs and on open range, care being taken to select a variety that does not have rough or open bark.

It must be borne in mind that provision must also be made for the growing of an ample supply of green-feed, some of which can be cultivated in vacant poultry runs.

The construction of a satisfactory poultry plant involves considerable capital outlay, and it is therefore important to study economy in each item. There should be no hesitation about the use of suitable material that can be found locally and at lower cost.

A great saving is effected by applying the method known as "bagging" instead of plastering brick-work for smoothness.

It is usual to enclose the poultry runs with six-foot netting-wire. To achieve greater success in preventing the birds from flying over fences, two strands of plain wire are placed about four inches apart above the netting-wire, the lower one also being the same distance from the netting-wire. For this addition, the supporting poles must, of course, be about ten inches higher than those employed in a six-foot fence.

It is very strongly urged that, before the poultry plant is erected, application be made to the Editor of Publications, Department of Agriculture, Pretoria, for a list of bulletins and leaflets giving details, plans and illustrations of all the various necessary buildings and their furnishings.

II. Sanitation on the Poultry Farm.

The sunny and, in most parts, dry climate of South Africa is of great assistance to the poultryman in keeping his poultry plant clean and his birds in good health. Careful attention should therefore be paid to the structural details of the poultry houses which should be so constructed as to allow of free ventilation, but draughts must be avoided. Stuffy and draughty houses lower the resistance of the birds, rendering them susceptible to many ailments and diseases. The internal furnishings should be portable and be so placed as to offer the inmates the greatest amount of convenience and comfort.

The houses should be built on dry, well drained ground, and the material employed in their construction should be of such a nature that the possibility of insects harbouring in it is reduced to a minimum. All the wood used should be stripped of bark and be well dressed with a suitable insect-repellent fluid.

For best results the floors should be made of cement or a similar smooth impervious material. Sunlight in a poultry house is very important, and the structure must be so proportioned that, for part of the day at least, the sun can penetrate its whole depth. The best aspect for the house is north-east. All scratching and nesting material should be kept clean and be replenished whenever necessary. The water and food containers should be so designed and placed that the scratching litter and droppings of the birds cannot enter them. There should always be an ample supply of fresh water for the birds and it should be protected from the rays of the sun. It is important to clean the water containers thoroughly and regularly, as dirty containers and stale water provide excellent breeding places for harmful germs and bacteria.

All droppings in the runs and on the dropping-boards should be swept together at regular intervals and removed to the compost heap or straight to the lands for incorporation in the soil. Poultry manure is an excellent fertilizer, and besides, if it is disposed of in this manner, flies will not be given the opportunity to breed in it. The runs should be so planned as to permit of quick drainage of rain water, otherwise puddles are formed, and it is apparently inherent in the nature of fowls to drink from these cesspools whenever the opportunity occurs, in spite of the fact that they have easy access to a clean water source. Such puddles usually harbour disease organisms and the cystic form of internal parasites.

As ground occupied by poultry soon becomes polluted with these poultry ills, a system of rotation should be favoured, so that the birds can be kept on a clean piece of ground, while another is cultivated to a crop. When the chicken runs become vacant, they should also be put to some crop and remain unoccupied until the following chicken season.

The wise poultrymen will always plan to have his chickens and young stock on the highest-lying portion of the poultry plant. If this is not done, there is great danger of the chickens becoming

infested with internal parasites such as tapeworms, roundworms, coccidiosis, etc., due to these being washed and blown down into their runs in the droppings of the adult fowls.

Poultry should be given sufficient food, and the ration should always be well balanced, no matter for what purpose the birds are kept. The food should be of good quality and not contain mouldy or other harmful material. A liberal daily supply of finely cut fresh green-feed helps greatly to maintain the health of the flock. It is best to feed it in a hopper. As fowls live in close contact with each other, and eat and drink from the same containers, it is obvious that one diseased member can rapidly spread infection in the flock. A close watch should at all times be kept for any sign of disease, and at the first sign the affected bird must immediately be removed to a place of isolation for treatment. Such a hospital should be kept clean with disinfectants whenever the need demands. Care must be taken not to convey infection on utensils, hands, clothes and feet to the flock. In the event of a bird recovering from sickness, it would be wise (unless it was not pathological) to keep it isolated for a further period of two or three weeks, before it is returned to the flock. Perhaps the best policy would be to set aside a house and run exclusively for birds that recover from sickness, and to keep them there until they are slaughtered at a later date.

There is also the possibility of introducing disease through birds arriving back from shows, and birds purchased for breeding purposes. Such birds should be kept in isolation for at least two to three weeks before they are introduced into the flock. When it is necessary to bring strange birds into a flock, it is always safest to procure these from a breeder who has a healthy flock and holds a certificate to the effect that his birds have been tested for B.W.D. and fowl typhoid.

The cleaning and disinfection of the chicken and adult houses and their furnishings, whenever the need demands, should not be neglected. After every hatching season all incubators should be thoroughly cleaned and fumigated with a suitable preparation.

When the poultryman suspects the presence of a contagious disease in his flock, he should lose no time in isolating the sick birds and call in the assistance of the Division of Veterinary Services.

III. Why Hens Decline to Sleep on Perches.

Sometimes the poultryman is faced with the annoying fact that hens decline to sleep on the perches provided for them. Where a whole group of hens act in this way, they are usually pullets which have recently been transferred from the growing quarters to the laying house, and which have not previously been trained to use perches. In such an event there is no alternative but to lift the birds on to the perches every night, until they go there on their own accord.

To obviate this trouble, birds should be trained from chicken-hood to perch by placing low perches about their quarters. When only some birds in a group decline to perch, there usually is some other factor responsible for their behaviour. There may be insufficient perching space for all the birds; the perches may be too narrow, too close together, too high or wrongly placed; or they may be infested with insects. Whatever the cause may be, it should immediately be remedied.

Perches serve best when they are arranged on the same level at about 2 feet above the floor. They should be of 2½ to 3 inch wide strips of wood with rounded edges, and be placed in rows not less than 1½ to 2 feet apart. Allowance should be made for each

bird to have 9 inches of perching space. It is best to lay 3 to 4 long, parallel perches in the deepest section of the house, and in line with the back wall, allowing a space of about 18 inches between the rearmost perch and the wall. Perches should never be situated in the front section of the house, where the birds are more exposed and liable to get wet from driving rain.

It sometimes happens that birds in a moult are bullied by the rest of the flocks, and consequently take refuge in the nesting boxes and corners of the house. They should be removed and put together in quarters where they have more comfort and undisturbed access to their food and water, which is very essential for a normal recovery.

IV. A Catching Crate for Handling Hens.

For whatever purpose pullets or hens have to be caught and handled, it is very important that the birds should not be chased or frightened, and that they should be disturbed as little as possible and be carefully handled. Chasing, frightening and rough handling of laying birds, particularly pullets, may cause a number of them to cease laying and, very likely, to go into a partial or even a complete moult, with consequent loss of eggs. There is also the danger of causing damage to the egg organs, e.g. rupture of the oviduct, breaking an egg in the oviduct, etc. In most cases such an injury is fatal. Where birds are kept on the semi-intensive or free-range system, a catching crate should be used. It is an appliance made of stout wooden strips, closed in with netting-wire. One end is provided with an up-and-down sliding door, and on top a door is placed for removal of the birds from the crate. The following dimensions may be used in the construction of the crate:—

Length, 6 ft.; width, 2½ ft.; and height, 2½ ft. The bottom must be solid. To trap the birds, the crate is so placed that the side with the sliding door is against the opening through which the birds must leave the house. The sliding door is lifted up and secured in that position, and the opening in the house is also opened. In most cases where the accommodation is the semi-intensive or free-range system, the birds will enter the catching crate readily. Should this not occur, they should be herded gently into it. When the crate has been filled, the sliding door is lowered, and the birds are caught and lifted through the top door. In this way the whole flock can be handled satisfactorily.

In most cases where birds are accommodated on the intensive system, difficulty will be experienced in enticing the occupants into the catching crate. In this case the employment inside the house of an 8-ft. length of 6-ft. netting-wire, with its long ends affixed to suitable lengths of light wooden poles, will be found very satisfactory. One pole end of the length of netting-wire is placed up against the wall about 3 ft. from one corner of the house, while the other pole end is held some 6 to 8 ft. from the wall. The birds are gently herded into the trap, and, when it is full, the open end is closed by placing it against the wall. The birds are then caught by an attendant inside the enclosure and handed out.

Development of the Sheep Industry in the Orange Free State.

Economic Factors Involved.

J. C. de Klerk, Sheep and Wool Officer, College of Agriculture, Glen.

THE exact date when the first stock farmers settled in the Trans Orange area cannot be determined with certainty, but it has been established beyond any doubt that as early as 1821, i.e. long before the Great Trek, farmers from the northern Cape Colony crossed the Orange river in search of grazing for their stock. Driven by drought and locusts, Cape farmers crossed the river again in 1828, the foremost pioneers settling with their stock along the Modder river⁽¹⁾.

Early in 1829 the civil commissioner of Graaff-Reinet was informed that the farmers north of the Orange river had begun to plough and sow and that some had penetrated as far as the Harts river⁽¹⁾. In July, 1829, field-cornet van der Walt gave notice of an agreement with the Bushmen to receive a piece of land along the Riet river, 49 miles long and 12 miles wide, in exchange for 3,000 head of small stock and 100 head of cattle. In 1830 a similar agreement was entered into between the Middleveld farmers and the Bushmen for another piece of land along the Riet river. Interviewed by the O.F.S. Commission of Enquiry in connection with the Free State-Basutoland border, J. J. Botes declared that, together with 14 or 15 families from the Beaufort area, he settled in the Smithfield area as early as 1830⁽¹⁾. It has been established beyond doubt, therefore, that by 1830 farmers had already settled north of the Orange river⁽¹⁾.

Originally this movement across the Orange river was of a very sporadic nature, but towards 1830 it developed into a seasonal migration. The farmers maintained that the shortage of grazing and water was not the only factor necessitating the moving of stock, but that in addition the animals always benefited by the change of pasturage and climate⁽¹⁾.

Although the first farmers in the Orange Free State possessed considerable numbers of large stock, they concentrated mainly on small-stock farming. The first large-scale importation of good merino sheep from the Cape took place in 1852 when a certain Page brought 600 ewes to the vicinity of Bloemfontein, and in 1855, when C. J. F. du Plooy imported 80 excellent rams from the Cape. Further importation soon followed and after that the sheep industry in the Orange Free State developed with increasing speed as will be shown hereunder⁽²⁾.

According to Thom,⁽²⁾ most farmers originally showed deplorable lack of enterprise. The methods learnt from their fathers as they grew up on the farm, were continued. They cannot be blamed for this, however, since at first they had no market for farm products, other than the Griquas and other Bantu tribes with whom they could barter, and the farm was expected to supply only the simple needs of the family. These needs, as regards clothes and other factory goods, were very few, since they manufactured practically all their own requirements and did not find it difficult to produce the necessary raw materials. Fortunately the farmers could live very cheaply

and since grazing was plentiful and could be changed as often as needed, the sheep remained in good condition and flocks rapidly increased by as much as 20 per cent. more than in the Cape⁽¹⁾.

Richardt⁽²⁾ also mentions the factors retarding the development of the sheep and wool industry, viz. the lack and exorbitant prices of fencing material and the habit of bringing the sheep to the kraal every night, owing to the presence of large numbers of beasts of prey.

Other factors responsible for the slow progress of sheep farming, were the practice of shearing on ground floors or in kraals and the method of packing, viz. baling good and poor fleeces together in the same pack. These practices were in no way discouraged by the buyers, who made no difference between good and poor quality wool⁽³⁾.

Nevertheless, the sheep industry in the Orange Free State made steady progress. After 1852 sheep were imported in large numbers from the Cape and in 1890 there were 6,619,992 sheep grazing on the Free State plains. Wool prices were, however, still very low. There was no market for wool in the Orange Free State and the clips had to be taken to the coast by wagon to be sold. In an attempt to improve conditions, the Volksraad decided in 1865 to establish a wool market in Bloemfontein⁽⁴⁾ but this effort was doomed to failure; at the first wool auction only 50 bales were offered, the wool being sold at 12d. to 13d. per lb. for scoured and 6½d. for unwashed wool. The Basuto wars brought a sudden end to these wool sales⁽⁴⁾.

Despite the low wool prices (3d. per lb. in 1868 and 5d. per lb. in 1879) which remained low except during the boom years of 1873 and 1920-22, the sheep industry gradually expanded, reaching its climax in 1931 when the Orange Free State had 13 million merino sheep. This increase in the sheep population and the export value of Free State wool are clearly shown by the following figures:—

Sheep Population, All Breeds (cattle in brackets for purposes of comparison):— (° and °).

Year.	Number of Sheep. (all breeds)	Number of Cattle.	Ratio of Cattle to Sheep.
1856.....	1,167,693	—	—
1880.....	5,196,147	612,007	1 : 8·4
1890.....	6,619,992	895,009	1 : 7·4
1899.....	8,332,490	1,284,448	1 : 6·4
1904.....	2,999,547	363,204	1 : 8·2
1907.....	8,020,308	585,007	1 : 13·7
1911.....	8,587,638	1,286,234	1 : 6·6
1918.....	7,956,886	1,575,295	1 : 5·0
1921.....	9,046,599	1,732,005	1 : 5·2
1926.....	10,480,123	1,955,772	1 : 5·3
1928.....	12,038,401	1,935,419	1 : 6·2
1930.....	12,869,110	1,680,097	1 : 7·6

Export value (° and °):

1856, (£50,000); 1868, (£230,000); 1899, (£363,776); 1904, (£253,197); 1905/6, (£545,000); 1907, (£795,000); 1908, (£713,000); 1909, (£989,000).

Every area, whether it was mixed Karroo grassveld or mixed long grassveld or sourveld, carried its quota of sheep. The following table shows the numbers of sheep in the various districts for

DEVELOPMENT OF SHEEP INDUSTRY IN O.F.S.

the period ending 31 August, 1929, when the Orange Free State had 11,908,849 merino sheep and 296,521 non-woolled sheep^(*):—

District.	Size in Morgen.	Number of Farms.	Sheep per District.	Sheep per Farm.	Sheep per Morgen.
Bethlehem.....	433,339	940	355,522	378	0·8
Bethulie.....	297,864	227	274,563	121	0·9
Bloemfontein.....	835,228	1,338	677,538	506	0·8
Boshof.....	1,180,872	1,135	630,007	555	0·5
Bothaville.....	520,128	652	233,878	358	0·4
Brandfort.....	508,636	573	460,294	803	0·9
Dewetsdorp.....	271,555	449	330,759	737	1·2
Edenburg.....	270,950	245	312,371	1,275	1·1
Fauresmith.....	1,038,139	669	688,276	1,029	0·6
Ficksburg.....	197,164	412	123,583	300	0·6
Fouriesburg.....	134,568	240	97,266	405	0·7
Frankfort.....	388,281	973	370,911	381	0·9
Harrismith.....	893,592	1,019	687,687	674	0·7
Heilbron.....	558,230	1,049	483,969	461	0·8
Hoopstad.....	908,409	904	444,876	492	0·4
Jacobsdal.....	368,625	264	188,323	713	0·5
Kroonstad.....	679,492	977	594,554	608	0·8
Ladybrand.....	337,176	720	286,572	398	0·8
Lindley.....	332,942	619	318,939	515	0·9
Philippolis.....	385,560	222	276,943	1,247	0·7
Reitz.....	316,008	644	287,672	446	0·9
Rouxville.....	318,427	382	374,884	981	1·1
Senekal.....	502,891	869	461,447	531	0·9
Smithfield.....	353,203	348	401,480	1,153	1·1
Thabanchu.....	358,344	477	384,791	806	1·0
Trompsburg.....	224,380	163	210,818	1,293	0·9
Vrede.....	658,022	896	681,481	760	1·0
Vrededorp.....	395,539	906	254,154	280	0·6
Wepener.....	198,676	192	236,219	1,230	1·2
Winburg.....	924,436	1,351	776,878	575	0·8
Zastron.....	222,566	419	297,797	710	1·3

The rise in the general standard of living and the development of the mining industry and other urban industries, made higher demands on farmers. They are expected to feed the cities and to buy the commodities from the city in increasing quantities. Farms now not only have to produce food for home consumption but must also bear mortgages; the farmer must have tractors, motor cars, etc., in order to keep pace with modern farming practices and maintain his social standard of living.

Many of the shortcomings of the present farming system can be ascribed directly or indirectly to the economic difficulties with which the farmer of to-day has to contend. The whole problem of deterioration of the soil is closely bound up with economic factors. The farmer is directly responsible for the abuse of our agricultural resources, but it would be extremely unfair to put all the blame on him. He has been caught in the whirlpool of an economic system, not created by him, which, to a large extent, compels him to exploit his agricultural resources in order to meet the demands placed upon him and maintain a reasonable standard of living. This economic system is largely of national, or to be more exact, international origin and the population as a whole should be held responsible for the practices resulting from such a system^(*).

Uncontrollable Economic Factors.

The following are some of the economic factors over which the sheep farmer has no or very little control and which contributed

towards the general deterioration of merino-sheep farming in the Orange Free State:—

(1) *Droughts*.—South Africa is known for its precarious climatic conditions and its recurring periods of grazing scarcity and water shortage. Most stock farmers therefore have the tendency to make up the leeway in years of prosperity by keeping more stock than the vegetation can carry, with the result that overstocking and trampling of the veld takes place. These periodic droughts are not a modern phenomenon; according to Theal, they also occurred in the 15th, 16th and 17th centuries. For the stock-farmer, therefore, they remain a problem of the greatest importance.

(2) *Stock Diseases*.—South Africa is not only ravaged by drought but also troubled with a large variety of stock diseases and parasites. Bluetongue and geilsiekte have occurred from the earliest times; in 1855 geilsiekte was so severe that the State suffered total losses estimated at 5 to 10 per cent. and in 1857 stock losses resulting from geilsiekte, wetness and cold in the O.F.S. amounted to 33 per cent.⁽⁴⁾.

Two parasites should be mentioned which in the recent past have become an important economic factor and have contributed towards making the position of the merino sheep farmer desperate, forcing him at times to turn to other branches of farming.

One of these is the *sheep blowfly*. Before 1920 the blowfly problem was practically unknown, but since then this problem has become a serious economic factor⁽¹⁰⁾. Direct and indirect annual losses run to vast sums and farmers who formerly went in for merinos on a large scale have now switched over to non-woolled sheep in order to evade this serious menace.

The other is internal parasites, especially the *nodular worm*. This parasite was found in stock for the first time in Natal during the years 1921-23.

During the severe drought of 1930-33 many Free State farmers moved with their sheep to Natal, and brought this parasite back with them. To-day it has spread over the whole of the Orange Free State. The direct annual losses through deaths caused by these parasites alone are very heavy. Indirect losses can be seen in the small, stunted sheep with very low resistance, small carcasses and light and undernourished fleeces. In addition, these parasites affect the fertility of ewes and lead to poor lamb crops.

The following is an extract from the report on the "Investigation of the Deterioration of Sheep farming in the south-eastern Orange Free State", 1941. As soon as sheep show signs of stunted growth, they are dosed once or twice with wireworm remedy, K.W.M., Tetram, Gow's or tobacco and blue vitriol. If their condition does not improve, the remedy is regarded as ineffective and something else tried. Remedies such as Nodulex, Vermisol, Cooper's Dip, Intestol, Coal tar, Ebedes, etc., are in general use. Except in a few cases, the practice of dosing regularly every three weeks with a recognised worm remedy is non-existent. Wherever sheep were in poor condition, post mortem examinations showed worm infestation, especially nodular worm. Irregular dosing with Cooper's, Gow's and Hairworm Remedy, etc., seems to have brought hairworm under control to a considerable extent.

(3) *Jackals*.—Jackals play an important part in sheep farming. In this connection it is only necessary to refer to the fact that Karroo farmers had to spend vast sums in order to have their farms enclosed with jackal-proof fencing.

The Orange Free State is still infested with jackals and a glance at the report of the Drought Investigation Commission of 1923 will give readers an idea of the evils to which the jackal pest may give rise. Only a few farms in the southern Orange Free State have been fenced in with wire netting; the rest of the Province has no vermin-proof fencing. In order to show how serious the jackal menace still is, it may be mentioned that, according to data collected by the K.W.B. and B.S.B. of Durban (on the initiative of the Transvaal branch of the N.W.G.A.), a total of 46,748 animals were killed by jackals in the O.F.S. during the five years 1941-1945⁽¹²⁾.

Naturally indirect losses are incalculable.

(4) *Fluctuating prices of mutton and wool.*—In the past the fluctuating prices of agricultural products were characteristic of farming in South Africa and very discouraging from the producer's

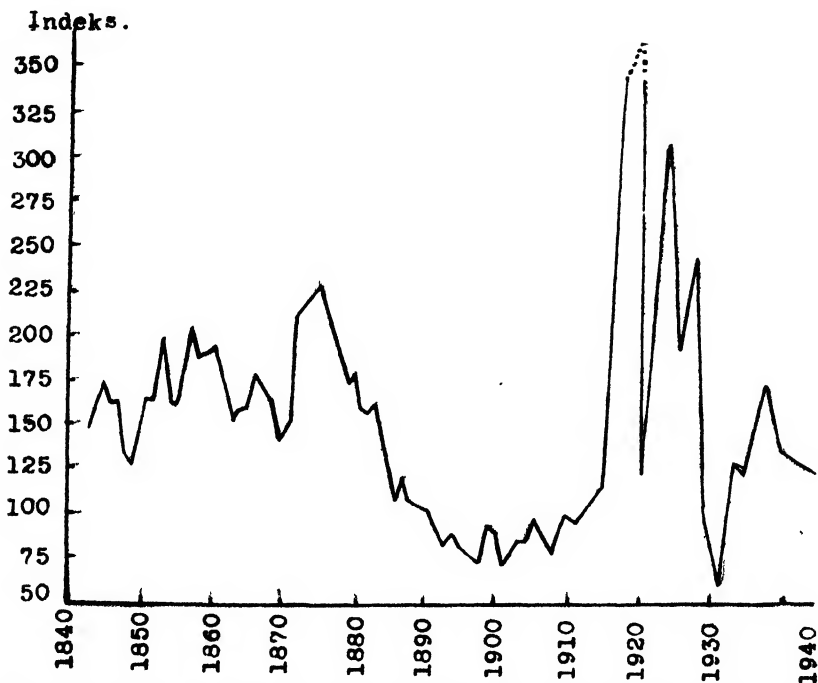


FIG. 1.—Index figures for export prices of wool shipped from Port Elizabeth, 1843 to 1939 (1910—14=100).

point of view. The farmer must bear all the risks attending production, but when his wool is marketed the price depends on the whims of the goddess of chance (see Fig. 1)⁽¹⁴⁾.

A few more historical facts may not be out of place here. In 1860 a general decline in the price of wool set in, and in 1862 the "Friend", discussing this fact in its leaders, ascribed it to the poor methods of packing.

Prices showed a further fall during the period 1865-70 as a result of the agricultural depression in South Africa and the depression in England following the American Civil war. In 1868 the price of wool fell by 3d. per lb. and on this basis the value of greasy wool in the O.F.S. was no higher than 3d. per lb. In 1870 the average price for greasy wool was 5d. to 6d. per lb. and for scoured wool 9d. to 12d. per lb. Owing to the high transport costs to the coast, woolwashing on a considerable scale was undertaken in the Orange Free State, notably at Harrismith, Reddersburg, Bloemfontein, etc.⁽⁴⁾.

After 1870, the discovery of the diamond fields caused a sudden rise in wool prices which reached its climax in 1875, after which a general depression set in, causing wool prices to fall lower than during any year before the period 1854-80. Only in 1878 could it be reported that prices were slightly more settled, and in 1879 wool was sold in Bloemfontein at 5d. per lb. for greasy wool, 5½d. to 5¾d. for medium super wool, and 7½d. to 9d. per lb. for scoured wool. In 1880 prices rose, greasy wool being sold at 6¾d. to 7d. and scoured wool at 13d. to 19½d. After that, wool prices fell gradually with short-term fluctuations until the Anglo-Boer war broke out in 1899(4).

The only period of stable wool prices ever experienced by Free State wool farmers occurred during the past world war, when an agreement was made between the Union of South Africa and Great Britain under which the latter bought the entire wool clip of the Union at an average basic price of 10·75d. per lb., as from Sept., 1940. In Sept., 1942, this basic price was raised by 15 per cent. to 12·36d. per lb. but was again reduced by 5 per cent. to 11·7d. in Sept., 1945. For the 1944-45 season Free State wool prices rose as high as 22d. per lb. the averages for some clips ranging from 11·7d. to 16·4d. per lb.

This wool-purchasing scheme was carried out by the British Wool-Purchasing Commission whose activities ceased on 30 June, 1946.

After the termination of this scheme, however, the Free State wool farmer was not again subjected to the vagaries of the old open-market system. In order to ensure future stability for the wool farmer through orderly marketing and the guarantee of a minimum price, the South African Wool Marketing Organization was established to co-operate with similar organizations in the Commonwealth and Great Britain. The basic price for the 1946/47 season was fixed at 14·15d. per lb. The minimum basic price is fixed in advance for one whole season and can only be altered from the beginning of the next season in consultation with other wool-marketing organizations.

This system of wool marketing is unique in the history of the marketing of products in that a minimum price is guaranteed to the producer in an open-market system without any maximum-price limitations. If the wool fails to realize the minimum basic price at which it was evaluated by the appraisers of the wool-marketing organization, this organization buys it at that price in the open market.

In order to administrate and finance this scheme, however, the wool farmer must pay a levy of 7½ per cent. on his gross wool returns. This levy may vary from year to year.

Mutton is in a very similar position.

Not only were there annual fluctuations, but also sharp seasonal fluctuations in spring and autumn prices. These annual fluctuations can be seen very clearly from Fig. 2.

As in the case of wool, the stock farmer had in the past always been at the mercy of the goddess of fortune as regards the price of mutton. In 1854 a Graaff-Reinet farmer bought ewes at 10s. to 15s. along the Caledon river, and this was regarded as a good price.

Even in those times the price of stock varied from time to time, but apparently the average prices of sheep were 10s. before 1860, about 7s. 6d. in 1865 and from 5s. to 7s. 6d. between 1875-80.

After the 2nd and 3rd Basuto wars and the discovery of the diamond fields, stock prices began to improve and in 1870 at a sale in Smithfield, Afrikaner sheep were sold at 8s. apiece and merinos at 10s. apiece, and in 1873 at an estate sale in Kroostad, dry ewes were sold at 15s. 6d. apiece(4).

DEVELOPMENT OF SHEEP INDUSTRY IN O.F.S.

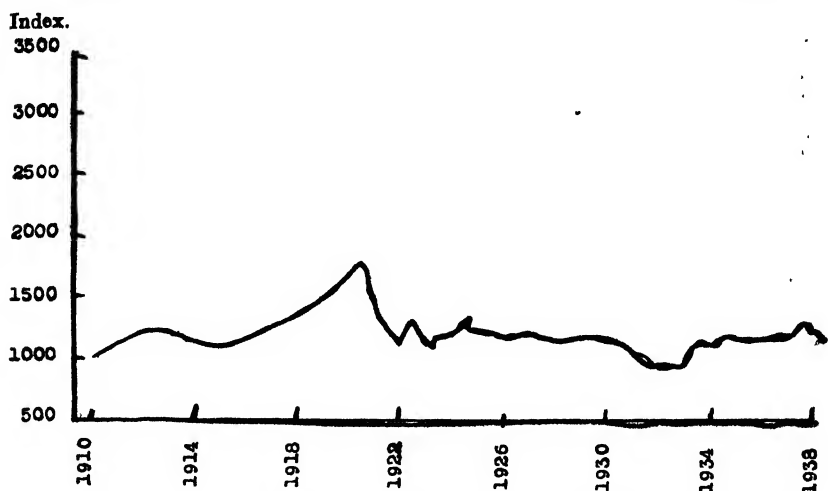


FIG. 2.—Retail prices of meat—1910 to December 1938—most important towns and cities.

(5) *Uneconomic holdings*.—The day of large farms was, however, passing. The system of hereditary tenure under which the land was subdivided among the owner's children aggravated the position and farms became smaller and smaller.

In order to give the reader some idea of the extent to which farms have been subdivided, the sizes of farms in the Rouxville* district are given below. The figures were elaborated by the writer from data obtained at the Deeds Office, Bloemfontein (1941).

Size of Farm.	Number of Farms.	Percentage.	Size of Farm.	Number of Farms.	Percentage
Under 50 morgen	68	10	801-400 morgen.	41	6
50-100 "	68	10	701-800 "	37	5.5
101-200 "	75	11	801-900 "	36	5.3
201-300 "	85	12.5	901-1,000 "	17	2.5
301-400 "	71	10.5	1,001-1,500 "	48	7
401-500 "	43	6	1,501-2,000 "	20	3
501-600 "	57	8.5	Over 2,000 "	6	1
TOTAL.....	—	—	—	672	100

The following are interesting examples of farms in the Wesselsbron district which, once large, had by 1943 been subdivided as follows:—

Farm A.—In 1930 the farm extended over 6,000 morgen and carried almost 6,000 sheep. At present it is occupied by eleven owners, who all go in mainly for crop production. To-day these properties carry only 2,500 sheep and have an annual maize production of almost 20,000 bags.

Farm B.—In 1935 the farm extended over 2,500 morgen. It has now been divided into 12 sections, occupied by ten owners.

Farm C.—Comprising 3,400 morgen in 1934, this farm has now been divided into 10 sections, occupied by eight owners.

Farm D.—Comprising 1,440 morgen in 1939, this farm now consists of four sections occupied by four owners.

* The Rouxville district lies on the line dividing the grassveld from the Karroo, and 60 per cent. of the farms are less than 500 morgen in extent.

Farm E.—This farm always carried 1,500 sheep; divided into 4 sections, it now carries not more than 600 sheep.

In other words, these five farms, occupied by five owners until 1930, are now occupied by 37 owners. The change in the system of soil utilization was a further contributing factor, especially in crop-raising areas where the large stock-farms of the past have been subdivided and put to the plough. The area under natural grazing has been whittled down and sheep have been pushed into the background.

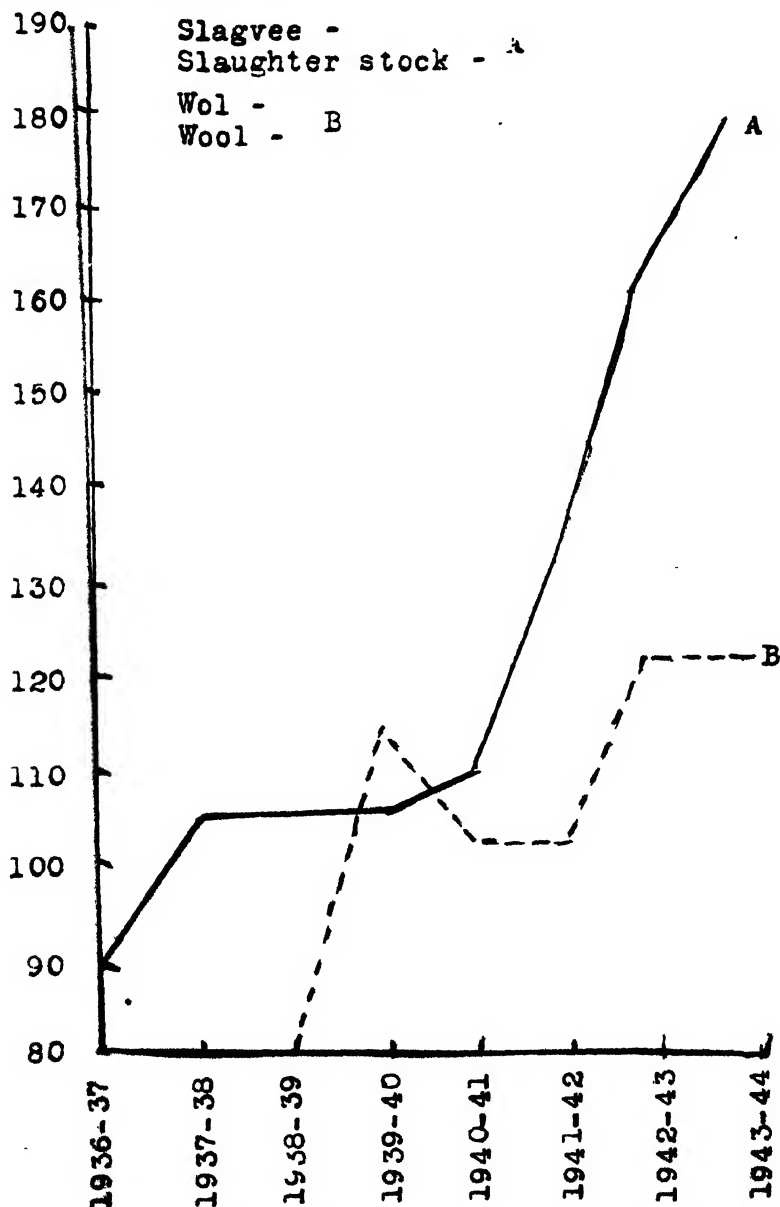


FIG. 3.—Index figures for meat and wool products, 1936-37 to 1943-44 (1936-37 to 1938-39=100).

This change in the farming system is a wholly natural occurrence, but it contributed largely towards the decline in the numbers of sheep kept on the farms.

(6) *Soil Depletion and Erosion.*—The deterioration of the natural grazing is one of the main causes of the decline of merino-sheep farming in the Orange Free State. This deterioration was caused by overstocking and trampling, and aggravated by the systematic annual burning of the veld, which has continued for more than a century, first by the Bantu tribes and later by the Europeans. The system of veld utilization applied in the past has brought about considerable changes in the natural vegetation. Not only have the original valuable grasses been ousted by stick grass over large areas, making it impossible to keep merino sheep there, but large portions of the southern Orange Free State were overrun by worthless shrubs such as “bitterbos” etc. The old system of continually moving stock to new, healthy grazing had to be discontinued, and to-day sheep are expected to thrive year in and year out on a small shrinking piece of land. Following on overstocking, trampling and veld-burning, soil erosion set in, aggravating the position still further. It became more and more uneconomical to keep merino sheep on such deteriorated veld, and the position of the industry is steadily growing worse.

(7) *War Influences on Sheep-Farming*.—There are three aspects of the influences of the last war which are of special interest for our purpose.

First, the outbreak of the war in 1939 gave rise to a tremendous increase in the demand for meat as will be seen from the following figures of the number of sheep slaughtered at municipal abattoirs in the Union⁽¹⁶⁾.

[illegible]

From this it is clear that, over the period of four years 1939-42, there was an increase of 37 per cent. in the number of sheep slaughtered. The number of sheep slaughtered in the Orange Free State alone, is of course, unknown. If only surplus or non-producing sheep had been sent to the abattoirs, it would not have made much difference.

In the case of cattle it is known that the slaughtering of cows and heifers was increased by 68 per cent. If breeding sheep were, therefore, slaughtered to the same extent as cattle, our merino stock will show a further downward tendency in the near future.

Secondly, prices boomed as a result of the great demand for meat and undoubtedly would have risen even higher if it had not been for the control measures instituted by the Government. It is important, however, that according to fig. 3, wool prices did not rise as high as mutton prices⁽¹⁵⁾. These favourable meat prices led many farmers to turn to crossbreeding for meat production, and in this way detrimentally affected the wool industry.

Since these favourable meat prices are at present being stabilized by the State, it may be expected that they will have an equally strong influence on tendencies in stock-farming.

Thirdly, land prices also rocketed, as is always the case during a war when there is a heavy demand for all agricultural products. An analysis of the rise in land prices in the O.F.S. is given in Fig. 4.

Fortunately for the farmer, this increase in land prices was checked by the control measures instituted by the Government. Whether the rise in the prices of animal products will compensate for the higher prices of land, is an open question. The fact remains, however, that the prices of agricultural products will have to fall again at some stage, whereas the mortgage on the farmer's property will remain the same⁽¹⁷⁾.

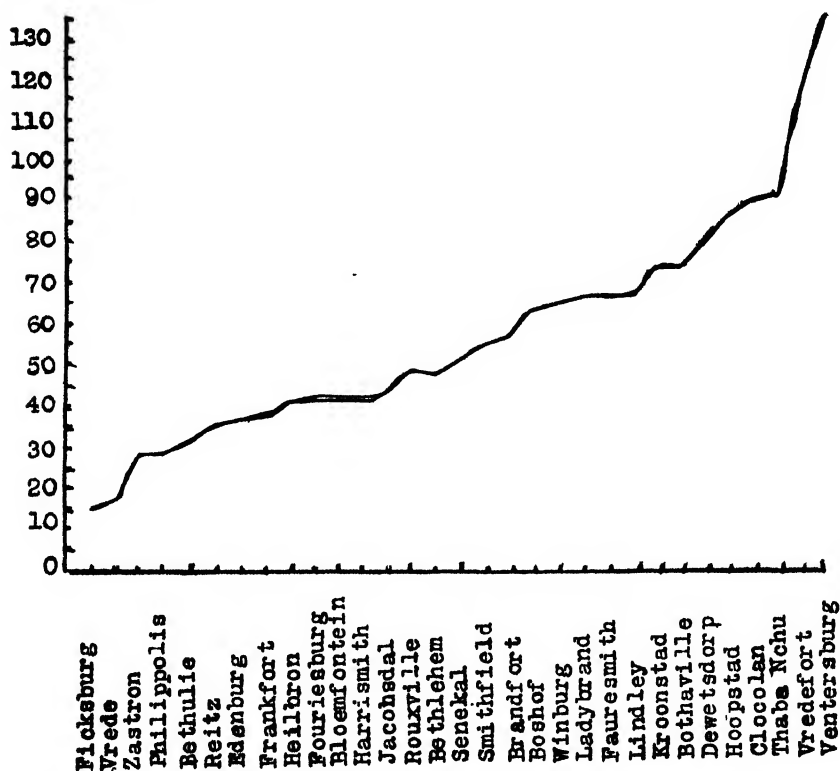


FIG. 4.—Rise in land values, on percentage basis, during 1940—45 of certain groups of farms in the O.F.S., with 1936—39 as basis=100.

Another factor which should also be borne in mind is the rich gold strike in the Orange Free State. The extent of its contribution towards the present inflation of land prices is, of course, difficult to determine.

Weaknesses in Sheep-farming, and their Causes.

Although we may be justifiably proud of the present standard of our sheep farming, we have no reason for self-satisfaction. Certain latent weaknesses are now gradually becoming evident. As the farming system became more and more intensive, a slow but cumulative depletion of our soil, vegetation and water sources took place, exhausting our natural wealth on which not only successful farming but also the future of our nation, depends. Overstocking and injudicious veld management caused general deterioration of the natural vegetation. In addition farming was often developed in the wrong direction. Sheep-farming, e.g., was unfortunately introduced in the long-grass areas, where internal parasites caused high mortality and the carrying capacity of the veld was diminished, since sheep inevitably graze the grass down to the ground.

The most serious error committed in the development of stock-farming was failure to stabilize the production factors, viz. the soil, water and vegetation. Since this is still a young country, however, the farmer or agriculturist cannot be reproached for not immediately establishing stable farming systems. Extensive observation was necessary before specific farming systems, properly adapted to the different regions in our country, could be recommended, and even to-day considerable investigation is still required.

Soil depletion and erosion are not, however, due only to ignorance and the application of wrong farming systems. There are other causes of which the most important is the economic pressure which forced many farmers into overcropping and overgrazing, especially after the price collapse of 1929. The repeated and violent price fluctuations experienced during the past quarter of a century also gave rise to a tendency among farmers to turn from inherently sound farming systems. Furthermore, exploitation of the soil becomes practically inevitable when farms are subdivided into small sections which cannot offer their owners an assured living.

Foundations of Agricultural Policy.

From the foregoing it should be clear that the farmer cannot work out his own salvation for the future, without State intervention.

To-day this fact is duly realized by the Government, which recently explained its policy in a White paper on Agricultural Policy^(1a). Its main aims are the following:—

(1) To contribute towards making "conservation farming" a general practice and in this way protecting and building up our soil, water sources and useful plant life; and

(2) to make farming more productive by raising the educational level of the farmer, encouraging the adoption of more modern farming methods, promoting price stability, stabilizing the market, ensuring better transport facilities, etc.

Economic Stability of Farming.

When the struggle for existence becomes too hard, man sometimes resorts to measures which he would not have applied otherwise. In their despondency, farmers turn to overcropping and abuse of the gifts of Nature. If conservation farming is to supersede overcropping, action will have to be taken not only in the biological and physical sense, but also in the sphere of economics.

During the period between the wars, farming all over the world received a catastrophic setback when the purchasing power of agricultural products fell in comparison with the prices of urban commodities, especially with the total price collapse of the years 1930-33. The turning point came during the last war, however, when rising costs and a world shortage of food led to high prices for food and agricultural products. Now, however, a sound balance must be restored.

In order to achieve the necessary price stability, the Union Government will make use of the control-board system introduced under the Marketing Act of 1937. The basic aim of the system is regulated marketing. Improved grading and cheaper distribution are important additional aims which have already largely been achieved in the case of meat. In consultation with the British Government, wool prices were also stabilized during the war years and in future the position will be maintained and improved by the Joint Wool-Marketing Organization which was established by the governments of the British Commonwealth in accordance with the wool-marketing plan.

Conservation Farming.

Conservation farming is a matter of faith as much as a method of farming. The key to conservation farming is to be found in the application of systems adopted to particular natural conditions with a view to eliminating the principal causes of erosion, viz. denudation and exhaustion of the soil, and loss of water. In the system applied, special emphasis should be placed on soil improvement and the keeping of better animals. This is the only way in which farming can be stabilized in the Orange Free State with its highly erodible soils.

Control of the natural veld for the protection of the vegetal cover, proper care of stock and, ultimately, erosion control, is just as important as building contour and diversion banks. The former involves the control of grazing and veld-burning, the construction of watering places, the building up of fodder supplies, the planting of fodder trees and the utilization of irrigable soil for the production of fodder reserves instead of marketable products.

The responsibility for conserving our agricultural resources rests on our farmers and will continue to do so in future. In order to make their efforts more effective, however, the Government will aid them, not only financially and through the construction of certain erosion works, but also by providing adequate professional staff for field work. With this end in view, a strong soil conservation and extension service has already been established.

The Government has already proved that it intends to suit the action to the word by passing the meat and wool marketing Acts, aimed at securing regulated marketing and stable prices for the producer. This fact is of the utmost importance to the sheep and wool industry in the Orange Free State.

The stabilizing influence of these Acts will enable the industry to adopt a definite policy, since the farmer now knows exactly what is at stake.

The Soil and Veld Conservation Act.

This piece of legislation is a very important milestone in agriculture and will prove to be of inestimable advantage to our livestock industry. Its aims, among others, are the following:—

(a) The withdrawal of animals from certain pastures for specified periods;

(b) limiting the numbers and types of livestock to be kept in any area;

(c) the control of veld-burning and the extinguishing of veld fires; and

(d) in general, the prevention of soil erosion, the protection, conservation and improvement of the natural grazing, the soil, the surface of the land, the vegetation and the water sources of the country as a whole.

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Improvement of Papaws.

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SLECTION plays a very important part in the improvement of all agricultural crops, especially in cross-pollinated crops such as the pawpaw. Since the pawpaw is cross-pollinated, it is difficult to maintain the desired selected qualities. This applies to all desirable selected pawpaw types, especially the golden oval-shaped type, "Hortus Gold" which is of commercial importance and should therefore be kept true.

Since seed cannot always be obtained from a reliable source, there is always the danger that unless timely precautionary measures are taken, cross-pollination will take place with undesirable types, in consequence of which the desirable qualities of the specially cultivated types would soon be lost, especially since pollen can be transported over long distances.

Where, particularly in the case of certain specially in-bred varieties, seed shows poor viability and where, in addition, it is eventually necessary to remove the great majority of the male plants, a considerable quantity of seed is required. It is therefore, imperative that seed of the desired types should as far as possible be selected by the farmers themselves for their own use. In order to do this successfully, however, and to eliminate all danger of hybridization with other undesirable types, the required precautionary measures against hybridization must be very carefully applied. In order to help growers in this respect the technique of controlled pollination is therefore briefly described.

Technique of Controlled Pollination.

When the seeds have been sown and the plants derived from them have yielded their first crop, the grower will find that differences occur. From these plants the grower now selects one or more of the best female plants to serve as mother trees. When selecting these plants, he should bear the following desirable characteristics in mind: vigour of trees, size and shape of fruit, colour of ripe fruit, which should be golden in this case, thickness of flesh, quality of fruit, yield and spacing of fruit on the stem, which should be such as to ensure no malformation in the fruit through overcrowding.

In order to retain the good qualities selected by the grower and to propagate the type as true to type as possible, the flowers of the mother trees selected must be pollinated with pollen from male trees of the same origin. This is easily accomplished if a brown paper bag is fastened around the female flower before it opens. The bag is kept in position by attaching it to the stem with a paper fastener.

Flowers of the selected male plants which are on the point of opening, are taken to the mother tree and the petals are removed to expose the pollen. The paper bags are now carefully removed from the female flowers and their stigmas brought into contact with the pollen of the male flowers. This is done by simply drawing the

male flower over the stigma of the female flower. After pollination, the paper bags are replaced over the female flowers and removed after a fortnight. The mother trees pollinated must be marked so that the grower will know which trees were pollinated and keep their fruit for seed.

Another method of controlling pollination is isolation.

In this case the selected type is planted in an isolated spot where there is very little danger of cross-pollination. Pawpaw pollen can be transported over long distances and where this method is followed, therefore, the various types should be planted at least half a mile apart and half a mile from other pawpaws. Although this method is simpler, it is not as reliable as the first method.

When the fruit is ripe, it is picked and the seed removed, washed, dried and stored until the following sowing season.

Yema Graft of the Vine :—

[Continued from page 436.]

time on the subject. It is convenient and his vineyard is soon uniformly established. There is, therefore, no particular need for any other method of propagation.

(2) If the farmer finds it more convenient to plant his wild vines and topwork them in the soil at a later stage, it will take longer to bud than to graft.

(3) Budding should be carried out about February—a period of the year when the farmer generally has many other duties to attend to.

Advantages of Budding.

(1) A practically perfect union is obtained. Consequently the flow of sap is hardly disturbed and the vine can perform its maximum functions and attain a good age.

(2) In comparison with grafting in the soil, the chances of a uniform vineyard are twice as good. If the budding during February was unsuccessful, the vines can be grafted in the soil in the usual manner and at the usual time, during the following spring, since they remain undamaged.

(3) Budded vines grow better during the first full growing season than those which have been grafted in the soil. They begin to grow early and develop very rapidly since the buds became established during the previous summer.

Vines which have been grafted in the soil, on the other hand, grow slowly and often become established only late during the year.

(4) It is not necessary to store budwood for long periods.

(5) White grubs are less troublesome, since the bud is opened up before the shoot develops.

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The Mango in South Africa.

I. Soil and Climatic Requirements, and Varieties.*

Dr. Raimund H. Marloth, Officer-in-Charge, Sub-tropical Horticultural Research Station, Nelspruit, Eastern Transvaal.

WITH such a variety of deciduous and citrus fruits being produced in the Union it is not surprising that the commercial production of other sub-tropical and tropical fruits is limited to only a few types. Of these the mango may be considered one of the most important, surpassing the avocado, banana, grenadilla, guava and litchi in acreage, capital investment, and value of crop produced.



FIG. 1.—Seedling mango tree several hundred years old, growing at a former slave-dealer's village in Kenya.

The mango is a native of eastern India and has several species and near relatives, but the cultivated type is restricted to one species, *Mangifera indica*. This, through the centuries, has spread to all tropical and sub-tropical countries in the world, and to-day this "King of Fruits" has assumed commercial importance in most of these countries. It is not known when the first mangoes were introduced into the Union, but Ducasse records an orchard in Durban planted about 1860. It is safe to assume that seedling trees,

* Parts II and III of this article will appear in later issues. Part II will deal with propagation and cultural practices.

originating from Mauritius, the East Coast, the Malay Archipelago or India, must have been growing in Natal many years before that date.

Soil and Climatic Requirements:

Since the mango is frost-susceptible, young trees and new growth being killed at a maintained temperature of two degrees below freezing point, the cultural area of the mango is limited by low temperatures. However, while magnificent tree growth is obtained under tropical conditions with an abundant rainfall spread over the whole year, very few varieties will crop well under such conditions. Ideal climatic requirements for combined growth and fruiting appear to be a cool winter and a hot summer, with relatively small night and day changes in temperature during both seasons and an annual rainfall of 30-40 inches, *provided* that from the start of blossoming-time till the fruit has started sizing up very little rain falls and the air is hot and dry. Rain or dew during the fruit-ripening period will result in considerable loss of fruit through disease. Soil type is hardly a limiting factor in modern commercial mango production, although it is essential that good drainage should exist, but, since the mango tree prefers a deep loam to sandy loam soil, better results can be expected from orchards on these types than from those on very sandy or heavy clay types.

Mango-Growing in the Union.

The principal mango-growing areas in the Union to-day are (1) the eastern Transvaal (Schagen-Hectorspruit zone), (2) north-eastern Transvaal (Tzaneen-Ofcolaco zone), and (3) Natal (coastal zone), with scattered plantings in the western Transvaal, eastern Cape Province, and western Cape Province. While our total plantings are small in comparison with those in some other mango-growing countries [India alone having over 1,100,000 *acres* of mangoes according to Sen (1944)], the past few years have seen an appreciable increase in the number of trees planted, while the number of trays of fruit sent to the eight principal markets in the Union has increased from a yearly seasonal average of about 250,000 before 1939 to 1,011,000 in the 1944-45 season. Until the figures for the 1946 Agricultural Census become available (the last Census including mangoes having been held in 1937) it is possible to make only a rough estimate of the extent to which the mango industry has

*Mango trees (farms and small holdings only) in South Africa.**

Year.	Variety.	Cape.	Natal.	Transvaal.	Orange Free State.	Total.
1930	Bearing.....	90	41,860	139,060	Nil.	181,010
	Non-Bearing.....	260	5,590	43,980	Nil.	49,830
	TOTAL.....	350	47,450	183,040	Nil.	230,840
1936	TOTAL.....	1,333	45,583	187,619	Nil.	232,535
1937	Bearing.....	344	40,139	184,031	Nil.	224,514
	Non-bearing.....	435	3,930	37,718	Nil.	42,083
	TOTAL.....	779	44,069	221,749	Nil.	266,597

* Data kindly supplied by the Office of Census and Statistics, and obtained from the respective Agricultural Censuses of the Union.

THE MANGO IN SOUTH AFRICA.

developed. New plantings and older trees increasing their production have resulted in an estimated quadrupling of the total production during the past ten years. From personal observation and from figures supplied by nurserymen it is thought that a tremendous increase in the 1937 total of 266,597 trees in the Union has taken place, and the major portion of this increase is not expected to be in full production till 1950 or later. Most of the new plantings have been made in the eastern and north-eastern Transvaal lowveld.

The mango tree is an evergreen, growing to an immense size under favourable conditions and known to reach several hundred years in age.

Tree growth proceeds from terminal shoots by several irregular flushes during the course of the year, and it is the timing of these flushes and their intensity which greatly determines the size of the crop ultimately borne, for although the tree usually flowers every year, the mango has a distinct tendency towards bearing in alternate years. Varieties also differ very greatly in their productiveness in different areas. In an extensive study of this behaviour, Lal Singh and his associates (1944) in the Punjab found that fruiting and vegetative growth was always at the expense of each other during the growing season, with a direct relationship between the number of shoots growing in one season and the number of flowering shoots the following spring. Fruit-bud initiation occurs only on one-season-old shoots, and the highest yield was from flushes initiated early in the previous season. An external factor such as frost, drought, excessive rain, etc., which upsets the equilibrium of the tree, will greatly accentuate the alternate bearing. In the Union normal flowering is from May to August, with the fruit ripening from November to February. Two types of flowers, staminate or males out-numbering the bisexual perfect ones with greenish-yellow ovary and single pollen-bearing stamen, are borne in clusters on branchlets forming terminal panicles which vary in colour, compactness and size, depending on variety.

Pollination and Fruit-Setting.

Through the courtesy of the Imperial Bureau of Fruit Production a questionnaire on fruit-setting of the mango was sent to over forty institutions in countries throughout the world in which the mango is grown, and this opportunity is taken of thanking the numerous workers who responded.

Wide divergence of opinion exists as to the agency responsible for the pollination of mango flowers. To those who claim that the mango is wind-pollinated it is pointed out that Nature has constructed the flower in such a manner as to provide for pollination by insects. The few pollen grains produced are large and show a tendency to cling together even in dry weather, the stigma is small and not provided with projections to catch wind-borne pollen, and the nectar produced serves to attract insects. The flowers are visited by flies, wasps, bees, butterflies, moths, beetles and bugs, these insects ranking more or less in the above order as to the number of visits. It seems that, in spite of the numerous insects visiting the flowers, only a very small number of stigmas have pollen brought to them from other flowers. With some varieties self-pollination to a limited degree has been indicated.

Fruit-setting is not dependent on pollination, but no fruit will reach normal size and maturity without pollination. There is no record of any truly seedless mango variety. Varieties differ greatly as regards degree of fruit-setting, whether it be of fruit lacking a

fertilized embryo and dropping before any appreciable development occurs, or of fruit which matures as small poorly flavoured fruit containing a seed coat without a developed embryo or seed, or of fruit which develops normally. The Peach and Sabre in South Africa, the Haden in Florida, the Maha-mudaliyar in Ceylon, and a number of varieties in India and in British Guiana are all reported to exhibit the 'small fruit' phenomenon which causes such concern to mango growers in the eastern Transvaal. It is here submitted that this phenomenon is a varietal physiological response to climatic conditions prevailing at the time of fruit-setting. Extensive observations on over fifty varieties growing in one orchard showed that some varieties set heavy crops of fruit all having a fertilized embryo, others set heavy crops with only a few fertilized embryos, while others like the Peach and Sabre are intermediate. However, it was noted in Kenya that Sabre trees imported from the Union bore excellent crops of normal fruit, 'small fruit' being absent.

In the Union, over a period of several years, the amount of 'small fruit' which remains on trees of the Sabre variety is negligible; counts made in the 1946-47 season in one orchard which bore 650 normal fruits per tree gave only 2½ per cent. of the total crop as 'small fruit'. However, in the same year adjacent Peach trees of the same age averaged only 65 normal fruits with 1,600 'small fruit' per tree, all of which remained hanging till the normal fruits were mature.

In general the climatic factors interfering with pollination are rain, mists, cool weather, and also hot dry winds. Sunny warm dry days with little wind during the blossoming season are favourable for pollination. but in South Africa, despite considerable research throughout the world on the problem, the failure of several varieties to bear normally and regularly remains a practical problem.

Varieties.

As is to be expected with a type of fruit which for centuries has been propagated by means of seedlings, many hundreds, even thousands, of mango varieties exist to-day, although horticulturally speaking a fruit is not given the distinction of being a separate variety until such time as it has been perpetuated by means of vegetative propagation and has been described. Wester (1922) describes some 300 varieties of Indian mangoes alone, while other mango-growing countries such as the Philippines, the Malay Straits, Java, Brazil, Hawaii, the United States, and even the Union can contribute at least an equal total number not included in his list. Popenoe (1941) places all mangoes in races and groups, and, because of the similarity between many so-called varieties and the confusion existing to-day in the world nomenclature of the great majority of varieties, definite varietal names should only be used for vegetatively propagated trees offered for sale when no doubt exists as to identification.

At the Sub-tropical Horticultural Research Station, Nelspruit, recent importations from Brazil, Ceylon, India, and the United States, plus local selections, have brought the number of varieties for planting in the Mango Variety Orchard to 68. Apart from this planting, very few grafted or budded trees of the selected better varieties grown elsewhere in the world are to be found in the Union.

THE MANGO IN SOUTH AFRICA.

It is intended to distribute from Nelspruit to other mango-growing areas vegetatively propagated trees of those varieties which after trial show promise, in order to ensure that in years to come, through propagation of such trees by commercial nurserymen and subsequent sale, an improvement in the quality of fruit produced, quantity borne per tree, and an extended marketing season for the mango industry is brought about.

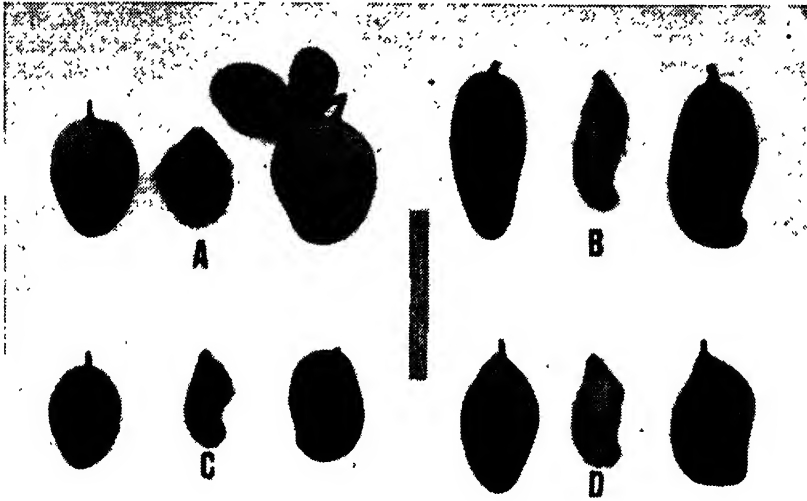


FIG. 2.—South African varieties of mango. A—Peach (note “small fruit” in relation to “normal”), B—Sabre, C—Kidney, D—Long Green.

The necessity for this depends on the fact that in the main only two varieties, the Sabre and Peach, are grown commercially in the Union; these are of unknown origin, and are propagated exclusively from seed. The fruit is not of the highest quality, the yield per tree is usually small, and the fruit is relatively susceptible to disease. Other seedling varieties which are rapidly falling out of commercial production are the Kidney and the Long Green because of an excessive degree of one or more of the foregoing factors. In Natal many other seedling types, such as the Rosella, Bombay Green, Carrot and others are grown, but only in small numbers and then usually in private gardens.

Seedling variants and hybrids of the commercial varieties are to be found in small numbers in all mango orchards due to the method of propagation, but only a few, such as the H.L.H., Monarein, and Jennifer have to date been singled out, named, and vegetatively propagated as new varieties because they possess desirable characteristics making them equal, if not superior, to the Sabre and Peach. A very promising field for the discovery of new varieties lies in such seedling orchards, and it would be well worth the time of growers to test fruit from, and observe, every individual tree in their orchards. Promising trees should be used as parent material for propagation by budding or grafting, as it cannot be known whether seedlings from such selected trees will be true to type.

Even in the case of the Sabre and Peach, selection for quality, high yielding, and regular bearing should be made, and the selected parent trees used for vegetative propagation. By such means throughout the centuries the present superior mango varieties grown elsewhere in the world have been developed, and the type of fruit referred to by some as "a piece of rope dipped in turpentine" eliminated.

To supplement the brief space devoted by Davis (1928) to mango varieties, the following descriptions of the main varieties grown in the Union are given, as such have not been published before.

Sabre.—This is a fairly large-sized fruit (length $4\frac{1}{2}$ inches, major diameter $2\frac{1}{2}$ inches, minor diameter 2 inches),* semi-reniform with equally rounded base and shoulders, the apex being broadly rounded and curved into a prominent beak with a slight nak. The smooth-surfaced tough leathery skin, yellow-green with bright red over-covering, is easily removed from the flesh. Flesh is deep-orange in colour with a melting texture and a medium amount of fibre. Eating quality is fair; sweet to insipid flavoured, turpentine taste present. Seed large and semi-reniform. Bearing quality average, fruit fairly resistant to disease, ripens mid-season, and very acceptable to the consuming public.

Peach.—Fruit fairly large (length $3\frac{1}{2}$ inches, major diameter 3 inches, minor diameter $2\frac{1}{2}$ inches), roundish oblique reniform in shape, slight depression at stem and equally rounded ventral and dorsal shoulders, the apex being broadly rounded with a depression on the ventral side and only a slight nak. Thick tough skin, smooth with white dots on exposed surface, the colour being apricot-yellow with pink to deeper red over-spread. Flesh orange to apricot-yellow in colour with tender juicy texture and fair amount of fibre. Eating quality is good; sweet flavour, and very slight turpentine taste present. Seed large and oval reniform. Bearing quality fair to poor, fairly resistant to disease, ripens mid to late season, and is the variety best-liked by the consuming public.

Long Green.—A fairly large variety (length $4\frac{1}{2}$ inches, major diameter 3 inches, minor diameter $2\frac{1}{2}$ inches), with many sub-types, some of which are much larger fruited, the *Large Green* and *Bombay Green* often being grouped with this variety. Form obovate with a tapering flattened base and apex beaked and somewhat pointed, the nak being set high-up. The smooth thin leathery skin with pellucid dots separates easily from the creamy-yellow flesh, which has relatively little fibre. Considered the best eating mango in the Union. In certain areas crops well, but is extremely susceptible to anthracnose and black-spot, so that usually only a very small percentage of the crop reaches maturity on the tree when disease control is not practised.

Kidney.—Smallish fruit, kidney-shaped, with yellow skin and flesh. Many sub-types and hybrids exist. Flavour is excellent, but the fruit is very fibrous, and although an excellent cropper, is very susceptible to black-spot. Definitely going out of commercial favour.

The Ideal Mango,

It is not proposed to give descriptions of the best imported varieties here, as it will be quite a number of years before their propagation will have reached the stage where trees of such varieties can be obtained for commercial planting. In the ideal mango (1) the eating quality must be of the highest, that is, the fruit must peel easily, have a full flavour without a taste of turpentine in a melting flesh, and show such a complete absence of fibre that the fruit can be eaten with a spoon; (2) the not too small-sized fruit should have an attractive appearance; (3) the tree should crop well and, if possible, regularly; (4) the susceptibility of the fruit to disease should be slight; (5) the keeping quality and shipping quality for possible export should be good; (6) the fruit should be marketable at a period of highest prices, this depending on whether the variety is early or late-ripening and on the locality in which it is grown.

* Fruit measurements here given are the average of several hundred fruits from different orchards.

THE MANGO IN SOUTH AFRICA.

The super-variety which embodies all the foregoing to the fullest degree has not yet been developed or discovered, but there are in the Union varieties now in bearing which show such distinct promise that their future commercial planting later cannot be doubted.

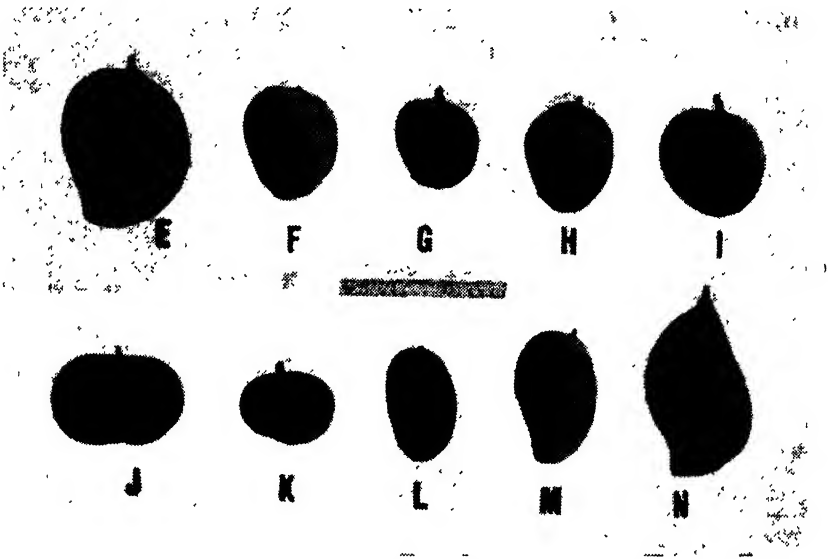


FIG. 3.—Some promising imported varieties of mango. E—Totapari Hyderabad, F—Mulgeba, G—Paheri, H—Singapur, I—Marina, J—Extrema, K—Santa Alexandrina, L—Aman Dusailri, M—Pico, N—Bungalosa.

Among these are.—

(a) the *Haden*, a precocious seedling of the poor-yielding *Mulgoba* group which originated in Florida, where it is now the leading variety;

(b) the *Paheri* (also *Pairi*, *Pirie*) noted by Pope (1929), in his description of mango varieties as among the best of all in cultivation;

(c) the *Bungalosa*, an extremely large-fruited late-maturing variety from Ceylon, apparently belonging to the *Sandersha* group, which, while lacking the luscious richness of the best mangoes, occupies a leading place in Florida and India;

(d) the *Alphonse* (also *Alfonso*) group which includes a number of variations, two introductions of these being unfortunately of the inferior types, but as the most celebrated and commonly grown mango in the State of Bombay the performance of two other introductions will have to be observed before it can be said that this group does not merit attention in the Union;

(e) the *Aman Dusailri* from Saharanpur which is a medium to small yellow-green fruit, not attractive in appearance, but of good eating quality and a heavy bearer;

(f) the *Extrema* and *Santa Alexandrina* from Brazil which are two apple-shaped stringless varieties whose rich and unusual flavoured melting flesh is said by some not to be that of a mango at all, but whose claim as excellent breakfast or dessert fruits will be difficult to contest.

Many other varieties, especially from Brazil, also show distinct promise, and while to date their greatest draw-back has been their very great susceptibility to disease, it is hoped that, when efficient disease control is practised, some of them will take a leading place amongst the best.

Wrong Application of Fertilizer.

J. H. Grobler, Lecturer in Chemistry, Grootfontein College of Agriculture, Middelburg, C.P.

IN applying fertilizer, the correct time and method are as important as the correct mixture or the correct quantity. There are two well-known methods of applying fertilizer. The first consists in even application over the whole field; the second is that of localized application, also known as row or hill application, around the plant.

Broadcasting fertilizer over the whole area, whether mixed with soil or not, means extra labour, apart from that of planting. Hill or row application is usually carried out by means of an apparatus attached to the planter and is therefore more economical, especially in view of the present shortage of farm labourers. It goes without saying that all fertilizer applied near the plant in the root zone can be reached by the roots, whereas in the case of the other method some of the fertilizer is wasted, which is the more undesirable with the present fertilizer shortage. In dryland farming, however, where the root system of plants attains a fairly wide horizontal spread in its search for water, it is better to broadcast the fertilizer.

The problem arises, however, of how to apply the fertilizer near enough to ensure maximum utilization without damaging the seed or seedlings by too high a concentration of salts.

For the correct placing of fertilizer, a knowledge of the movement of salts in the soil is necessary. Movement takes place mostly in the vertical plane, i.e., downwards after rain and upwards when evaporation takes place from the soil surface. Of the known fertilizers, nitrates move most readily, potash and ammonium salts somewhat less so and phosphates very little. This may be attributed partly to the fixation capacity of the soil for fertilizer. According to Sayre and Clark the fertilizers which damage or "burn" the young seedlings if applied wrongly, are mainly nitrate and potash fertilizers. They are more damaging in sandy soils and in hot, dry areas than in clayey soils and cold, moist areas. On the whole, legumes such as beans, soybeans and peas are more sensitive to damage of this type than other crops. A standard pattern for the application of fertilizer for all crops under all conditions is practically impossible. It has been found, however, that almost without exception better results are obtained by placing the fertilizer at the same depth as the seed. Applying the fertilizer near the seed at smaller depth, is an inferior method, for if it rains the fertilizer moves down and "burns" the seed, and if it remains dry the roots never reach it.

If the fertilizer is, however, applied near the seed and at the same depth, the latter germinates without coming into contact with the high concentration of salts; and when the root system develops, the fertilizer lies within the root zone. Research on various crops in different soils showed that for heavier applications, more crumbly soil and more sensitive crops, wider strips of fertilizer and wider spacing between fertilizer and seed will be required. The depth at which the fertilizer is to be applied, varies with the type of crop.

The Control of Pests in Stored Grain.

Dr. Bernard Smit, Principal Entomologist, Division of Entomology.

THE shortage of grain bags is going to be a serious problem on most farms for some time and the storage of our maize crop is going to be more difficult than usual on this account. All sorts of schemes have been suggested, but the fact remains that a great deal of the maize will have to be stored in bulk on the floors of sheds and storerooms. Comparatively few farmers are fortunate enough to have sufficient grain tanks to store all the maize they will have to keep on the farm. At the sheds of co-operative societies also, and even at the elevators, there will not be sufficient proper storage facilities to protect all the grain adequately.

Under such circumstances, the danger from damage by rats and mice and from the attack of weevils is much greater than usual, and this article is written to serve as a warning against these pests.

In the first place, the storerooms and sheds that are to be used for the storage of the maize crop should be made as rat-proof as possible. First, clean them thoroughly to remove all old grain that may be infested with weevils. Sweep down the rafters of the roof and ledges along the top of the walls to remove all dust, dirt, grain and any insects that may be lurking there. If there is old webbing from grain moths on the walls, it should be brushed down as well. Then sweep the floors and examine them for rat holes and cracks. The floors should be made of good solid concrete and all holes and cracks should be carefully cemented up. The walls of the store should also be plastered with good cement and be free from cracks. Examine doors and windows. The windows should be covered with galvanized gauze to make them insect- and rat-proof, but they may be left open for ventilation, unless there is danger of rain blowing in. Doors should fit well and they should be made rat-proof at the bottom by screwing on sheets of flat galvanized iron on each side.

To prevent rats and mice from getting into the roofs of store-rooms from the outside, care should be taken not to stack such materials as old logs and timber against them, and all openings under the eaves and gutterings should be screened with wire gauze.

Before the new grain is put into the storeroom, the floors, walls and rafters should be well sprayed with 5 per cent. D.D.T. solution which should be allowed to dry, so that all surfaces are covered with fine crystals of D.D.T. Any insect which subsequently walks over this will soon die. The grain should be well dried before storing, because the drier it is the less susceptible it is to weevil attack. Grain which contains less than 8 per cent. of moisture will not be attacked at all. No matter what precautions are taken, the grain may be infested when it is put into the store, so that a careful watch must be kept for weevils while the grain is in storage. The weevils will probably not show up during the winter months, but in spring they begin to breed rapidly and can do very considerable damage in a short time. Rodent injury and weevil damage often go together. The rats spoil the grain and by urinating in it

make it very susceptible to weevil attack. Control the rats and mice, therefore, at all times with traps, poisons, calcium cyanide powder or with cats, wherever possible.

When grain is heavily infested with weevils, it must be fumigated with carbon bisulphide, but this is a dangerous and expensive process and is not very suited to the treatment of large quantities of grain in stores. It is far better to avoid the necessity for this by taking the above precautions and storing the grain in the right way from the time it is harvested.

Wrong Application of Fertilizer :—

[Continued from page 464.]

For maize the following method may be tried: Strips one inch in width on both sides of the seed, on a plane one inch lower than the seed level. For applications exceeding 400 lb. per morgen, the strips may be wider.

For potatoes, 2-inch strips on both sides, 2 inches from the seed and level with the lower portion of the seed, are recommended.

In winter cereal planters the seed comes into contact with the fertilizer, but suitable machinery should be used to ensure a minimum loss of seed as a result of damage through burning. It is not sufficient, therefore, to apply the correct fertilizer in the correct quantities. The method of application should also be correct in order to derive maximum benefit from the available fertilizer.

New Bulletins.

The undermentioned Bulletins have recently been published :—

Bulletin No. 260., Nutrition of Poultry, Price 6d.

Bulletin No. 264., Turkeys, Price 3d.

These Bulletins are obtainable from the Editor of Publications, Department of Agriculture, Pretoria.

The Developed Merino Sheep and the Uniformity of its Fleece.

M. L. Botha, Sheep and Wool Research Officer, Grootfontein College of Agriculture, Middelburg, Cape.

THE lack of uniformity in wool growing on the body folds of merino sheep has always been the cause of serious discrimination against the developed type. Accurate experimentation has proved that wool growing on the body folds is stronger than that growing between folds. Evidence as to variability in length is lacking.

Length is one of the most important attributes in wool; the manufacturer desires good length in the spinning of high quality yarn, and length adds very materially to weight, on which basis the producer is paid. Therefore, it is highly desirable to have good and uniform length throughout the fleece.

During the judging of merino sheep at shows, the ring-side observer often hears the judge's criticism: "Good length but should show better length on the folds". The judge might well be asked whether the relatively small amount of wool on the crests of body folds is actually slower-growing wool than that of the rest of the fleece. Such a variation, if it existed, would be as objectionable as the variation of fibre diameter in wools on and between body folds.

Differences in length on and between body folds must be due to differences in rate of growth or to some other cause, and uneven shearing appears to be a most likely one. Developed sheep, and especially the excessively developed type, confront the shearer with great difficulty at shearing and it seems a likely explanation that the lack of length of wool on the body folds might be due to the shearer's inability to clip the wool uniformly short over areas on which folds occur.

Some preliminary observations were made at Grootfontein College of Agriculture to throw light on the subject of variation in length in fleeces grown by developed sheep. Three mature merino rams of the developed type were selected for the study. Sampling sites were prepared at the commencement of the growth period by clipping the wool close to the skin with special fine curved pointed scissors. Sampling sites were selected on the forequarters—inclusive of the apron folds on the hindquarters of the sheep, provision being made for corresponding pairs of small samples on and immediately off folds. After an exact period of 365 days, the wool samples were taken from the sites in the exact manner employed in preparing the sites a year previously, care being taken to avoid double cuts.

The following determinations were made on each of the 10 pairs of samples taken:— (1) staple length, (2) straight length, (3) coefficient of variation in straight length, (4) crimp ratio, that is, straight length: staple length, (5) fibre thickness, (6) coefficient of variation in fibre thickness, (7) number of crimps per inch, and (8) degree of medullation.

It is evident from the results that there is no significant difference in staple length, straight length and crimp ratio of the wool grown on, as opposed to off, folds. However, wool grown on folds is approximately 28 per cent. more variable in straight length; that is, the mean straight length for the two positions is the same, but the wool on folds is less uniform in length. The results, therefore, do not support the contention that wool grown on folds grows more slowly than wool off folds, and a sheep lacking in length on

its folds must be looked upon as lacking length in general. In these cases the apparent good length elsewhere can only be ascribed to faulty shearing.

The data also reveal that fold wool is stronger than the rest of the fleece by approximately 10 per cent., and that the former exhibits about 57 per cent. fewer crimps. These figures corroborate the findings of previous investigators who found that the wool on the folds is stronger and has fewer crimps than the wool of the rest of the fleece.

In respect of uniformity of fibre thickness and degree of medullation, no significant difference was established between samples grown on and off folds.

Further, the results of the study revealed that, judging by crimps per inch, the wool appeared finer than the measurements obtained by actual thickness measurements. This is not uncommon in the case of rams' wool.

In conclusion it can be stated that the wool growing on the apron and body folds of merino sheep is of the same staple length and straight length as the rest of the fleece, and any difference in length between wools grown on such adjacent regions must be ascribed to irregular sheering and not to a difference in growth rate. The wool on folds is more variable in straight length, it is stronger, and it has fewer crimps per inch than the wool off the folds.

Development of the Sheep Industry in the Orange Free State :—

[Continued on page 454.]

6. Official Yearbook of the Union. 1910-1917.
7.
 - (a) O.F.S. Census, 1856.
 - (b) O.F.S. Census, 1880.
 - (c) O.F.S. Census, 1890.
 - (d) O.R.C. Census report, 1904.
 - (e) Official Yearbooks of the Union : Various editions.
8. (a) Official Yearbook of the Union, No. 12.
(b) Report on the Union Agricultural and Animal production, No. 12.
9. The reconstruction of Agriculture, 1943.
10. Journal of the Department of Agriculture, Union of South Africa, 1923.
11. „ Onderzoek na die agteruitgang van die Skaapboerdery in die suidoostelike Vrystaat.”
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12. Report of N.W.G.A. : Bloemfontein—October, 1946.
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16. FICK, J. S.—Young South Africa : October, 1943.
17. DE KLERK, J. C.—Farming in South Africa : February, 1946.
18. White paper on Agricultural policy, 1946.
19. Soil Conservation Act, No. 45 of 1946.

The Farm Home.

(A section devoted mainly to the interests of Farm Women.)

Removal of Stains.

Miss Elma du Preez, Home Economics Officer, Department of Agriculture.

THE purpose of dry cleaning is to clean clothing in such a way that it does not shrink, crease, bleach or lose its colour. It is essential that every housewife should know something about the simpler processes of dry cleaning, since most stains can be removed at home, provided a little care and a few simple precautions are taken.

Methods of Cleaning.

There are three different methods:—

1. *The use of absorbents* such as meal, bran, chalk, magnesia powder, fuller's earth, etc.

This method can only be applied when the article is not very dirty. If the absorbent is heated in an oven, it will prove more effective. It is sprinkled over the whole upper surface and thoroughly rubbed into the dirtier spots. The article is then rolled up tightly and covered with a towel and left for a few hours or overnight. The powder is then brushed out and the process can be repeated, if necessary. This method can also be used on felt hats which need cleaning.

2. *The use of solvents*.—Water may be used for the removal of non-greasy stains. For stains of a fatty nature use petrol, benzine, turpentine, carbon tetrachloride, eucalyptus oil or methylated spirits, but since all of these substances except carbon tetrachloride are inflammable, great care must be exercised when handling them.

3. *A combination of methods one and two*.—Make a paste of an absorbent and a solvent, e.g. benzine and chalk. The mixture is rubbed on to the upper surface of the article to be cleaned, allowed to dry and then brushed off. Repeat the process if necessary. This is a very effective method for cleaning felt hats.

It is important to remember that all fatty stains must be dry before a solvent is used.

How to Dip an Article in Benzine.

Stains of a non-fatty nature must first be removed with water or an absorbent and the material allowed to dry. Then shake out thoroughly and dip the article into enough benzine to cover it. Portions which are very dirty should be rubbed lightly and rinsed in benzine once or twice.

After the article has been thoroughly rinsed, it is hung up in the shade. Iron with a damp cloth; the heat of the iron and the dampness of the cloth will help to remove the benzine smell. Buttons need not be removed, but pearl buttons will lose their gloss and wooden buttons will also be spoilt if they are not removed. The benzine can be allowed to stand for the dirt to settle, strained, and used again. Old benzine has a stronger smell and the article will have to be cured for a longer period.

Detergents.

These can be used to remove separate stains or, in the case of mens' suits, to clean whole upper surfaces. All soapiness must be thoroughly sponged out after the article has been cleaned. Dyes may be affected by a detergent which must therefore first be tested out on the article before being used.

A useful detergent may be made up as follows:—

1 oz. ether.	1½ oz. good white soap.
1 oz. alcohol.	14 cups soft water.
3 oz. ammonia.	

Cut up the soap and beat it in 2 cups of water until dissolved. Add the rest of the water and other ingredients. Keep tightly corked in a jar.

If used as a general cleaning agent, it must be mixed with equal quantities of hot water.

The following mixture is very effective for removing scorch stains:—

1 grated onion.	2 oz. soap.
½ pint vinegar.	1 oz. fuller's earth.

Grate the soap and add it to the onion and vinegar together with the fuller's earth. Place the mixture in a saucepan and boil for 10 minutes. Strain and keep in a tightly corked bottle. This mixture is used by spreading a small quantity over the surface of the garment and allowing to dry. Then it is brushed out well. Repeat the process if necessary. *Logwood* is used for dark-coloured articles to revive their colour. The dye is prepared by boiling 1 cup of logwood in 2 pints of water. For cleaning dark blue or black articles, e.g. gyms, a little ink and enough ammonia to blacken the blue are added.

Points to Remember.

(1) Treat the stain as soon as possible, since chemical changes may take place through exposure to air, drying of the stain, or washing. In this way stains become more fixed, with the result that stronger reagents have to be used. Sometimes the stain becomes so fixed that it is impossible to remove it without damaging the fibre. With the exception of greasy stains, all stains must be rinsed out immediately in cold or lukewarm water, but never in hot water.

(2) Determine the nature of the stain because upon this depends the correct treatment. Incorrect treatment as, for example, ironing a blood stain, may set the stain instead of removing it. Soap will set fruit stains owing to the reaction of the soap on the acid in the fruit juice.

REMOVAL OF STAINS.

(3) **Examine the fabric and treat the stain with the reagent which will be least detrimental to the material.** Always treat coloured articles with care. If possible, first test the reagent on a piece of the same material. Use weak reagents at intervals and confine their application to the stained surface. Use acid on wool and silk, but not on cotton and linen. For the latter use alkalis which, in turn, are not suitable for animal fibres. Strong acids or the repeated use of any of these chemicals will destroy all fibres. Rayons should be treated with special care since strong acetic acid will dissolve acetate rayon and even a weak alkali will turn white rayon yellow.

General Procedure for the Removal of Stains.

1. *Non-greasy Stains.*—(a) Stretch the stained material over a bowl and keep it in position with elastic or string; (b) damp the stain, using a medicinal dropper or glass rod; and (c) apply the reagent in the same way and rinse the stain after each application. Repeat as often as is necessary and rinse thoroughly after each application.

2. *Grease Stains.*—Grease removers must always be used on the dry material. Lay the stained article with the right side of the stain on a piece of absorbent cloth or material, and rub the stain, on its wrong side, with an absorbent cloth which has been dipped into the remover. If possible, use a cloth which has the same colour and texture as the stained material.

Classification of Stain Removers.

1. *Absorbents*—e.g. blotting paper, starch, fuller's earth, magnesia powder, meal, meal and bran.

These substances do not have a detrimental effect on the material, and are more effective if heated.

2. *Grease solvents.*—(a) Carbon tetrachloride and other non-inflammable liquids containing chlorine which are excellent for removing oil, fat, tar or resin stains.

(b) Benzine, petrol, turpentine, alcohol, methylated spirits, and paraffin which are all inflammable, and should be handled very carefully.

(c) A mixture of (a) and (b). The former evaporate more rapidly than the latter. Remember that the mixture is not always non-inflammable. Carbon tetrachloride has no detrimental effect on colour or fibre. Petrol and benzine may affect certain dyes. Alcohol affects certain dyes and acetate rayon. Turpentine may affect some dyes, but will not damage the fibre. Paraffin has no harmful effect on either dyes or fibres.

3. *Acid solvents*, e.g. oxalic acid, hydrochloric acid, lemon juice and vinegar (acetic acid), salts of lemon and tartaric acid, the first-mentioned being most commonly used.

(a) The correct strength for oxalic acid is 2 teaspoons in 1 pint of water, a warm solution being more effective than a cold one. This substance is very poisonous, so label it carefully. It bleaches coloured articles, and a concentrated solution will dissolve vegetable fibres, e.g. cotton and linen.

(b) Dilute 1 part of concentrated hydrochloric acid with 9 parts water. This acid removes most stains, but is detrimental to all fibres and will bleach coloured articles. It is used for white silk or wool and, if very dilute, for white cotton or linen.

(c) Lemon juice in combination with salt and sun is more effective than other acids as it does not affect the fibre.

(d) Vinegar contains from 4—5 per cent. acetic acid and has no detrimental effect on dyes. If acetic acid crystals are used, dissolve 1 oz. in 1 pint water. A concentrated solution is safe for all fibres except acetate rayon.

(e) The commonest method of using salts of lemon is to place the crystals on the stain and moisten them with water. This substance may damage the fibre and, if not thoroughly rinsed out, may also affect dyes.

(f) In the case of tartaric acid, dissolve 1 teaspoonful in 1 pint water; it may affect dyes.

4. *Bleachers*.—These may be divided into 2 classes, namely (i) alkalis such as Javelle water, chloride of lime (bleaching powder), potassium permanganate (which must never be used alone but with alternate applications of an acid, such as oxalic acid, as it leaves a brown stain), ammonia, etc.; and (ii) acids, such as oxalic acid.

(a) *Javelle water* is prepared by mixing together 1 lb. washing soda dissolved in 4 cups boiling water with $\frac{1}{2}$ lb. chloride of lime dissolved in 4 cups cold water. After stirring, leave the precipitate to settle and pour off the top, straining the liquid through a white cloth. Store Javelle water in dark jars, but do not keep it too long as it deteriorates. Use the full strength for stains.

(b) Chloride of lime is prepared by dissolving 2 T. in 4 c. water. For use, mix 1 T. of the liquid with 1 c. water.

Both (a) and (b) are never used on silks or wools or coloured articles.

(c) *Potassium permanganate*.—1 teaspoonful crystals in 1 pint water. It is safe on all white fibres with the exception of white artificial silk. Apply it alternately with oxalic acid to the stain.

(d) *Hydrogen peroxide*.—A little acid is added to make it more stable but before using the peroxide add a few drops of ammonia to counteract the acid. It has no detrimental effect on materials as long as it is washed out afterwards, but may affect dyes.

(e) *Ammonia*.—Household ammonia must not be used as it contains soap. A 10 per cent. solution may be used with safety on all fibres, but it may affect coloured articles.

(f) *Sodium thiosulphate*.—1 teaspoonful in 1 c. water. This may affect coloured articles and fibres, but is very effective for iodine stains.

(g) *Sodium hydrosulphate*.—1 teaspoonful in 1 c. water. It may affect coloured articles. A fresh solution must be made each time it is required, as it deteriorates very quickly.

5. *Dissolving agents*, such as banana oil and amyl acetate. The latter affects some dyes, but is safe for all fibres except acetate rayon.

REMOVAL OF STAINS.

Stain Removal Chart.

Stain.	Material.	Treatment and Remover.
1. Blood (protein stain)	Washable.....	(a) Cold water. (b) Soak in a salt solution 1-8 water. (c) Dilute ammonia. (d) For stubborn stain, soak in salt water for 1 to 2 hours; then treat with one of the following:—Hydrogen peroxide, potassium permanganate, Javelle water.
	Non-washable.....	(a) Cold water. (b) A mixture of starch and water in the form of a paste, and allow to dry. (c) Hydrogen peroxide.
2. Candle wax.....	Washable.....	(a) Scratch off as much as possible. (b) Iron over brown paper or blotting paper. (c) Treat with turpentine or paraffin. (d) Wash in warm soapy water.
	Non-washable.....	(a) Same as for washable material. (b) Carbon tetrachloride or benzine; wood alcohol used to remove colouring. (c) Hydrogen peroxide.
3. Chewing gum...	Washable.....	(a) Scrape off as much as possible. (b) Rub spot with piece of ice. (c) Wash. (d) Use turpentine, paraffin or carbon tetrachloride.
	Non-washable.....	(a) Same as for washable material. (b) Carbon tetrachloride.
4. Coffee and Tea..	Washable.....	(a) If milk present, first get rid of the protein. (b) Lemon juice, salt and sunlight or warm glycerine (dissolves tannic acid). (c) A paste of borax. (d) Potassium permanganate. (e) Boiling water poured from a height; use kettle.
	Non-washable.....	(f) Javelle water. (a) Sponge with lukewarm water. (b) Hydrogen peroxide.
5. Chocolate or Cocoa.....	Washable.....	(a) Sponge with lukewarm water. (b) Wash. (c) Wood alcohol and a few drops of ammonia.
	Non-washable.....	(a) Sponge with water. (b) Carbon tetrachloride. (c) Hydrogen peroxide.
6. Rust.....	Washable.....	(a) Lemon juice. (b) Oxalic acid. (c) Salts of lemon. (d) Tartaric acid, hydrochloric acid.
	Non-washable.....	(a) Oxalic acid. (b) Lemon juice.
7. Egg.....	Washable.....	(a) Sponge with cold or lukewarm water. (b) Hydrogen peroxide to bleach. (a) Cold water.
	Non-washable.....	(b) Sponge with a fat solvent such as benzine. (c) Hydrogen peroxide.

Stain.	Material.	Treatment and Remover.
8. Perspiration, etc.	Washable.....	(a) Sponge immediately. (b) If yellow stains remain, use hydrogen peroxide. (c) If colour has been affected, hold article over the fumes of an ammonia bottle. (d) Lemon juice for old stain. (e) Javelle water or potassium permanganate. (f) Soak for one hour in vinegar water ($\frac{1}{4}$ c. in 1 pint water). Treat with weak ammonia or borax water.
	Non-washable.....	(a) Sponge with water. (b) Lysterine may be used to remove smell.
9. Paint and Varnish	Washable.....	(a) When old, such stains are difficult to remove as a result of oxidation which forms less soluble compounds. Scratch off as much as possible. (b) Soak in turpentine, pork fat or butter. (c) Wash in warm soapy water. (d) Boil in washing-soda water (3 T. in 1 gal. water).
	Non-washable.....	Turpentine, alcohol or banana oil.
10. Nail Polish.....	Washable.....	(a) Acetone not used on acetate rayon. Methylated spirits. (b) Banana oil.
	Non-washable.....	Except for acetone, same as for washable.
11. Mould.....	Washable.....	(a) Lemon juice, salt and sunlight. (b) Oxalic acid. (c) Hydrogen peroxide, potassium permanganate and Javelle water.
	Non-washable.....	(a) Lemon juice, salt, etc. (b) Hydrogen peroxide.
12. Mustard.....	Washable.....	(a) Soap and water. (b) Diluted ammonia. (c) Hypo.
	Non-washable.....	(a) Make paste of starch and water. (b) Wood alcohol. (c) Alcohol followed by ammonia.
13. Iodine.....	Washable.....	(a) Soap and water. (b) Dilute ammonia. (c) Hypo.
	Non-washable.....	(a) Make paste of starch and water. (b) Wood alcohol. (c) Alcohol followed by ammonia.
14. Lipstick.....	Washable.....	(a) Treat immediately. Rub with pork fat and wash in hot soapy water. (b) Hydrogen peroxide, Javelle water.
	Non-washable.....	(a) Carbon tetrachloride. (b) Banana oil. (c) Hydrogen peroxide.
15. Grass.....	Washable.....	(a) Wash immediately. (b) Alcohol. (c) Hydrogen peroxide, potassium permanganate or Javelle water.
	Non-washable.....	Alcohol.
16. Fats, Oil, Tar....	Washable	(a) Remove as quickly as possible in warm soapy water. (b) Rub with lard and wash afterwards, especially for grease stains.

REMOVAL OF STAINS.

Stain.	Material.	Treatment and Remover.
16. (Continued.)	Washable.	(c) Dirty oil contains carbon solids and other minerals which may remain behind after the oil is removed. To remove them, use the following mixture: 1 T. turpentine, 1 T. soft soap and 1 t. methylated spirits.
	Non-washable.	(d) If badly stained, boil as for paint. (a) Take on fresh stains, brush out and repeat. (b) Carbon tetrachloride, etc.
17. Ink.		
(a) Writing Ink. .	Washable.	(a) First remove the iron with an acid. (b) Bleach with potassium permanganate or hydrogen peroxide.
(b) Marking ink. .	Washable.	(a) Iodine or acid bleaching powder followed by concentrated hypo. (b) Treat with potassium permanganate followed by acid, or hydrogen peroxide.
(c) Indian ink. . . .	Washable.	(a) Treat with a dissolved soap. (b) Bleach.
(d) Printer's ink. .	Washable.	Same as for Indian ink.
(e) Red ink.	Washable.	(a) Soak for a few minutes in hot water and borax. (b) Methylated spirits.
18. Medicines.	Washable.	(a) Use alcohol. (b) Bleaching agent. (c) If medicine contains sugar, sponge with water and then bleach. (d) If it contains iron, treat with acid.
19. Dyes.	Washable.	(a) Water and sunlight. (b) Sodium hydrosulphate and rinse in ammonia water. (c) Glycerine. (d) Bleaching agent. (e) Soak in methylated spirits to which a few drops of ammonia have been added.
20. Shoe Polish.		
(a) Black polish. .	Washable.	(a) Use turpentine. (b) Carbon tetrachloride. (c) Lard.
(b) Brown polish. .	Washable.	(a) Warm water and soap. (b) Wood alcohol. (c) Bleaching agent.
21. Fruit juices.	Washable.	As fruit juices sometimes contain tannic acid, do not use soap before other reagents. Boiled fruit juices are easier to remove than fresh fruit juices. (a) Boiling water poured from a height. (b) Lemon juice, salt and sunlight. (c) Glycerine—heat.
	Non-washable.	(d) Bleaching agents, sodium hydrosulphate. (a) Sponge with hot water. (b) 10% acetic acid. (c) Hydrogen peroxide.
22. Soorch.	Washable.	(a) Moisten and leave in the sun. (b) Hydrogen peroxide. (c) Woollen articles may be rubbed with sandpaper. (d) Bleaching powder on woollen articles and linens.
	Non-washable.	(e) Borax. Hydrogen peroxide.

Stain.	Material.	Treatment and Remover.
23. Water marks....	Washable.....	(a) Dampen the whole upper surface and iron. (b) Steam. Sponge stain with luke warm water—never hot water as it sets the stain. If a grease spot remains, launder washable materials in warm soapy water. (a) Absorbents—dust the powder over stain. Let it stand until it absorbs the grease, then brush off. (b) Solvents—sponge with carbon tetrachloride or benzine.
24. Meat juice or gravy.	Washable.....	
	Non-washable....	
25. Metallic stains. (a) Copper, brass and tin	Washable....	(a) Apply vinegar, lemon juice. (b) Rinse. (c) Do not use chlorine bleaches. Mercury will remove the stains. First scrape off as much as possible; then apply mercury with a stick until the stain is absorbed.
(b) Lead or solder stains.....	Washable.....	
26. Tobacco stains...	Washable.....	(a) Cold water and glycerine, sponge with cold water. (b) Work warm glycerine into stain and allow to stand for $\frac{1}{2}$ hour. (c) Wash with soap and water. (d) If stain cannot be completely removed, bleach in the sun. (e) Moisten with lemon juice before bleaching. (f) Wood alcohol. (g) Javelle water.
27. Enamel.....	Non-washable....	New stains may be removed by rubbing lightly with a cloth dipped in turpentine or petrol. If this does not remove the stain allow to soak for a while in the solvent.
28. Ice-cream.....	Washable.....	(a) Sponge with hot water. (b) Wash. (a) Sponge with hot water. (b) Use carbon tetrachloride.
	Non-washable....	
29. Jam and preserves.	Washable.....	(a) Sponge with hot water. (b) Soak in a little hot water and borax.
30. Milk.....	Washable.....	(a) Sponge with cold water. (b) Wash. (a) Sponge with cold water. (b) Grease solvent.
	Non-washable....	
31. Shiny patches on woollen materials		Brush lightly with a rubber or fine wire brush. In the case of navy blue or black material, sponge with ammonia and water and iron under a damp cloth.
32. Soot.....	Washable and Non-washable.....	Remove with tetrachloride. Do not treat with water.
33. Unknown stain.	Washable.....	(a) Sponge with water. (b) If greasy in appearance, try a grease solvent. (c) Treat alternately with potassium permanganate and peroxide or oxalic acid in the case of white material.

Crops and Markets

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by

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Price Review for March 1947.*

Fruit.—Except for apples which were plentiful, offerings of deciduous fruit, particularly peaches, pears and grapes, decreased sharply on the markets, and experienced a strong demand. The markets were, however, well supplied with avocados, guavas and pineapples which were disposed of at satisfactory prices.

Tomatoes.—Smaller consignments of tomatoes reached the markets, and prices, particularly in the case of tomatoes of good quality, showed a further increase. On the Johannesburg market the prices of National Mark No. 1 tomatoes increased from 5s. 6d. to 7s. 10d. per tray, and ordinary tomatoes on the Cape Town market from 3s. 4d. to 4s. per tray.

Potatoes.—Potatoes still appeared in large quantities on the markets, and further price reductions took effect. For example, on the Johannesburg market, the prices of Transvaal potatoes, grade 1, fell from 10s. 1d. to 9s. 6d. per bag; those of Orange Free State potatoes on the Durban market from 12s. 11d. to 9s. 10d. per bag; and those of Cape potatoes on the Cape Town market from 15s. 5d. to 12s. 9d. per bag.

Onions.—Except for the Durban market which was well supplied, the supply of onions decreased further, and prices increased appreciably. For example, on the Johannesburg market, the prices of Transvaal onions increased from 14s. 8d. to 17s. 6d. per bag; those of Cape onions on Cape Town market from 11s. 9d. to 14s. 3d. per bag and those of Cape onions on the Pretoria market from 13s. 7d. to 20s. 3d. per bag. On the Durban market, however, the prices of local onions declined from 16s. 1d. per bag in February to 13s. 4d. per bag in March.

Vegetables.— Except for pumpkins which were plentiful, vegetable offerings decreased on the markets, particularly in the case of green peas, carrots and cabbage.

* All prices mentioned are averages.

Seed, Grain and Fodder.—Moderate quantities of sweet grass were offered, and were disposed of satisfactorily, but teff hay, particularly of good quality, was scarce. Insufficient lucerne offerings realized high prices in spite of the poor quality.

Eggs and Poultry.—The egg supply was limited, and prices were generally high. Further increases in the maximum wholesale and retail prices of eggs were announced during April. Good quantities of poultry were available on the Johannesburg market and high prices were realized, particularly for poultry of good quality.

Review of the Wool Market.—During March, 1947, a total of 45,037 bales of wool was offered for sale in Union ports, of which 34,390 bales (73 per cent.) were sold.

Competition was keen, particularly for short wool and grassveld wool which were offered in limited quantities. The average prices for most types of wool were higher than those of the previous month.

Index of Prices of Field Crops and Pastoral Products.

This index, as shown elsewhere, remained unchanged for March, 1947, viz., at 203.

The most important changes occurred in the following groups:—

- (a) "Hay" increased from 127 to 154, particularly as a result of an increase in lucerne prices.
- (b) "Pastoral Products" increased from 187 to 189 due to a further increase in the average wool prices.
- (c) "Slaughter Stock" decreased from 191 to 182, as a result of the reduction in the seasonal price of slaughter cattle in controlled areas.
- (d) "Poultry and Poultry products" increased from 248 to 251 in March, due particularly to a further increase in the prices of eggs.

Agricultural Conditions in the Union during March, 1947.

Weather Conditions.—Scattered light showers of rain occurred in all four provinces, especially in the eastern parts of the country, viz., the Transvaal highveld, north-eastern Orange Free State, Natal, Transkei and the Border area of the Cape Province. The western parts of the country, particularly the western and southern Orange Free State and western Transvaal had, however, very little rain and severe drought conditions prevailed in some parts.

Crops.—Summer cereal crops were still promising, especially in the eastern parts. Record crops were expected, for example in Natal, while prospects in the Transkei were also very promising. In the western Orange Free State and western Transvaal summer cereals had already suffered severely with the result that yields would not be according to earlier prospects. Rain was urgently needed to improve the prospects.

CROPS AND MARKETS.

Stock and Pastures.—As a result of the scattered showers of rain the condition of stock and pastures varied. With the exception of areas where good showers of rain occurred, timely rains were necessary for the pastures and water supplies, especially in the western and southern Orange Free State and the north-western Cape Province. Except for lumpy skin disease and nagana which still occurred in Natal, stock diseases were quiet.

Maximum Prices of Eggs.

The maximum wholesale and retail prices of eggs in controlled areas fixed on 7 March 1947 have been increased all round by a further 3d. per dozen for each grade as from 11 April 1947. Prices are now as follows:—

Description of Eggs.	Maximum Price Per Dozen.	
	Wholesale.	Retail.
	s. d.	s. d.
Grade I:—		
(a) Extra Large.....	4 1	4 5
(b) Large.....	3 11	4 3
(c) Medium.....	3 9	4 1
(d) Small.....	3 7	3 11
Grade II:—		
(a) Large.....	3 9	4 1
(b) Medium.....	3 7	3 11
(c) Small.....	3 5	3 9
Grade III:—		
Mixed.....	3 6	3 6

The maximum price at which eggs may be sold in uncontrolled areas has been fixed at 3s. 11d. per dozen (See *Government Gazette Extraordinary* of 11 April 1947.)

The 1947 Citrus Control Scheme.

SINCE the outbreak of the war when the export of citrus fruit decreased sharply, a Citrus Board has been established in order to exercise control over the local disposal of these export fruits. For this purpose certain powers were granted to the Board.

The first citrus control scheme took effect on 1 January 1940 and two months later it was continued under a War Measure. A pool system has been created under the scheme in order to secure equal treatment to all growers.

Until 1942 the Board controlled only the fruit of export growers. In 1942, however, a measure of control was also exercised over non-exporters and full control as from 1943.

On 1 March 1946 the new post-war marketing policy of the Citrus Board came into operation. Since 1946 the fruit of growers selling less than 1,000 pockets of citrus fruit per season, i.e. non-exporters, was free from control. Formerly a levy of 5s. per ton

was imposed only on all fruit exported. Since 1946, however, a levy has also been placed on citrus fruit sold locally, viz., 1½d. per pocket for 1st grade citrus fruit and 1d. per pocket for 2nd grade. Only exporters paid this levy, i.e. growers marketing more than a 1,000 pockets of citrus fruit per season.

As from 1947 the new citrus control scheme came into operation under the Marketing Act. The following are the most important amendments effected under the new scheme:—

(a) The pooling of the proceeds of sale of the export quality oranges, grapefruit and lemons belonging to exporters will be done on the basis of variety and weight category, instead of variety and count.

(b) Each exporter is directed to export 75 per cent. of his export quality fruit and to sell 25 per cent. of it locally. All these will then participate in the export pool. If the exporter packed less than the prescribed 75 per cent., the balance will participate only in the first grade local market pool.

(c) The basis on which non-exporters were determined (viz. growers of less than a 1,000 pockets of citrus fruit per season) was unsatisfactory and has been changed to the number of trees. As from 1947, therefore, all growers who have a total of 300 citrus trees (i.e. sweet orange, grapefruit and lemon, other than rough lemon) will not be subject to control, provided they comply, where required to do so, with the grading and packing regulations. They also do not pay a levy. The trees of growers having more than 300 trees will, however, be controlled and the proceeds of sales will be pooled. They will again pay the levy of 5s. per ton on fruit exported and 1½d. and 1d. per pocket on 1st and 2nd grade citrus fruit, respectively, marketed locally.

(d) Only five varieties instead of seven, as was the case previously, will be recognized in 1947.

Prices of Citrus Fruit.—The maximum prices of oranges, grapefruit and lemons for the 1947 season were announced recently. (See *Government Gazette Extraordinary* of 11 April 1947.) The prices of oranges per pocket have been fixed as follows as from 11 April 1947.

	<i>Producers' Prices.</i>		<i>Wholesale Prices.</i>		<i>Retail Prices.</i>	
	s.	d.	s.	d.	s.	d.
1. <i>First Grade:</i>						
(a) Extra Large	4	3	4	6	5	0
(b) Large	4	0	4	3	4	9
(c) Medium	3	9	4	0	4	6
2. <i>Second Grade:</i>						
(a) Extra Large	3	6	3	9	4	3
(b) Large	3	0	3	3	3	9
(c) Medium	2	9	3	0	3	6
(d) Small	2	3	2	6	3	0
3. <i>Third Grade:</i>						
(Unsized)	2	3	2	6	3	0

(See *Government Gazette Extraordinary* of 11 April 1947.)

The above prices are 6d. per pocket higher for all grades than those fixed on 12 April 1946 for the previous season. Corresponding prices of grapefruit and lemons are 3d. per pocket higher in all cases than those of the previous season.

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Average Prices of Apples, Pears and Grapes on Municipal Markets.

SEASON (1 July to 30 June).	APPLES (Bushel box).						PEARS (Bushel box).		GRAPES (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johan- nesburg.
	Oheni- muri.	White Winter Pear- main.	Wem- mers- hoek.	Oheni- muri.	White Winter Pear- main.	Wem- mers- hoek.	N.M. No. 1.	Other.	All kinds.
1938-39.....	s. d. 7 2	s. d. 6 0	s. d. 5 10	s. d. 7 3	s. d. 8 0	s. d. 4 3	s. d. 6 7	s. d. 4 2	s. d. 1 3
1940-41.....	8 4	7 1	6 4	8 11	10 8	5 0	8 11	6 3	1 8
1941-42.....	8 11	7 11	7 3	9 1	10 9	6 9	7 8	8 0	1 11
1942-43.....	14 9	11 6	9 1	10 8	12 11	6 11	—	10 8	1 10
1943-44.....	12 2	11 3	9 11	13 10	11 2	5 10	—	14 11	3 7
1944-45.....	14 9	13 5	11 6	12 0	12 0	8 3	—	13 2	6 10
1946—									
January.....	18 8	22 10	—	—	—	—	—	15 9	3 7
February.....	15 6	13 7	12 9	15 5	15 2	5 6	—	13 4	1 5
March.....	12 11	14 4	16 11	12 10	14 1	12 8	—	13 5	3 6
April.....	13 1	13 2	13 5	13 4	14 3	15 2	—	15 3	—
May.....	19 8	20 3	21 3	16 2	20 4	15 2	—	17 10	—
June.....	22 8	23 2	22 6	17 9	21 2	13 8	—	—	—
July.....	21 3	22 10	18 10	14 5	19 2	—	—	—	2 11
August.....	21 7	22 11	20 2	16 3	18 3	—	—	—	12 4
September.....	19 1	20 6	—	15 10	21 0	—	—	—	8 1
October.....	21 8	20 0	—	15 3	22 7	—	—	—	—
November.....	24 4	18 6	—	17 5	25 6	—	—	—	—
December.....	14 8	17 4	—	36 4	40 0	—	—	7 6	7 4
1947—									
January.....	18 0	16 7	—	27 6	—	—	—	9 5	4 5
February.....	19 8	14 5	—	19 7	—	—	—	11 2	4 7
March.....	12 3	10 5	17 8	12 0	19 3	—	—	13 0	1 10

Prices of Avocados and Papaws on Municipal Markets.

SEASON	AVOCADOS (Per Tray). (a)				PAPAWS. (b)						
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Eliza- beth Std. Box.	Bloem- fontein Std. Box.	
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.			
1938-39.....	s. d. 1 6	s. d. 0 11	s. d. 1 3	s. d. 1 11	s. d. 2 0	s. d. 0 10	s. d. 1 7	s. d. 2 0	s. d. 2 0	s. d. 1 8	
1939-40.....	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 9	
1940-41.....	1 10	0 10	1 6	2 4	2 1	1 1	1 9	2 2	2 3	1 9	
1941-42.....	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0	
1942-43.....	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 7	
1943-44.....	4 1	1 6	3 7	5 3	3 2	1 5	2 5	3 5	3 3	2 7	
1944-45.....	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0	
1946—											
January.....	8 1	1 8	5 10	9 2	8 10	1 6	4 5	7 11	6 4	3 11	
February.....	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 5	4 7	
March.....	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8	
April.....	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6	
May.....	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2	
June.....	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0	
July.....	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11	
August.....	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4	
September.....	9 3	—	6 5	6 8	2 10	1 6	2 8	3 2	2 3	2 11	
October.....	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10	
November.....	8 6	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8	
December.....	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6	
1947—											
January.....	7 11	—	5 5	—	4 6	1 8	4 10	6 6	8 0	3 9	
February.....	2 6	—	2 11	—	4 9	1 5	7 10	—	8 11	—	
March.....	2 0	—	2 11	3 11	6 5	3 10	8 2	8 1	—	3 5	

(a) Season 1 January to 31 December.

(b) Season 1 April to 31 March.

Prices of Bananas and Pineapples on Municipal Markets.

SEASON.	BANANAS (Per Crate) (a)			PINEAPPLES. (b)						
	Cape Town.	Johannesburg.	Pretoria.	Cape Town. Box.	Durban. Dos.	Johannesburg.		Port Elizabeth. Box.	East London. Dos. Large.	Bloemfontein. Bushel Box.
						Ordinary. Dos.	Queens and Giants. Dos.			
1938-39.....	s. d. 22 5	s. d. 9 10	s. d. 16 5	s. d. 5 4	s. d. 3 8	s. d. 1 1	s. d. —	s. d. 3 5	s. d. 1 2	s. d. 4 10
1939-40.....	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
1940-41.....	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941-42.....	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942-43.....	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3
1943-44.....	37 8	13 2	18 10	8 3	3 6	2 4	2 1	6 3	2 10	8 4
1944-45.....	—	—	—	10 4	3 9	2 6	3 9	7 3	3 3	8 6
1945-46.....	—	—	—	—	—	—	—	—	—	—
1946-47.....	—	—	—	—	—	—	—	—	—	—
January.....	31 9	14 4	14 11	10 4	3 0	3 5	3 4	3 7	2 9	9 3
February.....	54 3	12 0	13 8	8 4	2 9	2 8	4 0	8 5	4 6	9 7
March.....	69 7	17 3	23 6	9 10	5 9	3 0	3 8	7 1	6 7	11 6
April.....	75 5	29 5	17 7	11 8	5 7	4 0	5 4	9 5	2 7	9 4
May.....	76 8	29 8	22 2	7 6	4 6	3 4	3 6	8 3	3 10	8 7
June.....	77 11	23 5	26 7	10 7	5 0	4 7	4 7	7 5	6 3	12 3
July.....	60 11	25 4	25 8	15 7	3 2	9 3	10 8	15 5	5 7	13 5
August.....	72 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10
September.....	66 5	20 6	30 8	10 1	7 7	6 5	7 2	12 2	4 7	13 11
October.....	78 10	28 6	34 6	15 5	6 5	6 9	6 5	13 10	4 3	14 5
November.....	63 8	47 10	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11
December.....	67 7	30 7	35 4	16 5	4 5	7 0	—	11 11	4 7	17 8
1947-48.....	—	—	—	—	—	—	—	—	—	—
January.....	41 7	20 2	20 4	9 2	5 1	2 3	3 6	6 8	3 6	7 5
February.....	46 0	14 10	15 10	6 10	2 0	2 0	2 7	5 4	3 7	6 8
March.....	47 5	18 4	22 10	9 3	—	3 6	—	8 3	5 2	11 8

(a) Season 1 January to 31 December.

(b) Season 1 October to 30 September.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.		Johannesburg. Table.	Durban.	Cape Town.
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.			
1938-39.....	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40.....	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1940-41.....	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1941-42.....	12 5	12 8	9 10	11 11	11 2	12 7	7 3	6 4	5 4
1942-43.....	10 5	13 11	10 4	13 10	13 0	14 8	9 10	7 1	8 6
1943-44.....	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1944-45.....	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1945-46.....	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1946-47.....	—	—	—	—	—	—	—	—	—
January.....	12 9	13 1	9 11	14 8	12 3	13 5	18 2	7 8	14 7
February.....	13 5	13 10	9 9	10 4	12 2	14 0	16 0	8 1	10 8
March.....	13 10	15 2	11 4	14 9	13 9	17 0	12 6	9 6	12 5
April.....	17 8	17 5	14 6	16 9	12 6	17 8	9 11	7 5	9 1
May.....	16 4	17 11	12 0	18 0	19 11	20 10	10 4	7 1	11 4
June.....	20 3	17 11	14 4	18 4	15 4	18 1	9 4	8 2	9 4
July.....	16 7	18 7	15 5	16 8	17 7	20 5	10 4	8 8	12 4
August.....	18 7	18 4	15 7	18 3	16 9	19 4	11 3	8 9	13 1
September.....	16 1	17 7	16 1	19 11	19 3	20 5	15 0	12 11	14 2
October.....	10 8	14 5	12 11	14 8	10 4	15 10	19 0	15 6	17 0
November.....	12 3	9 3	13 0	—	14 3	18 10	19 11	19 1	21 3
December.....	14 8	15 3	15 6	17 10	16 11	15 7	17 1	14 6	17 7
1947-48.....	—	—	—	—	—	—	—	—	—
January.....	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February.....	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March.....	11 4	12 4	9 9	12 10	12 9	13 5	18 5	14 8	14 8
April.....	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May.....	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June.....	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July.....	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August.....	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September.....	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October.....	24 9	23 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December.....	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1947-48.....	—	—	—	—	—	—	—	—	—
January.....	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 3
February.....	14 8	14 5	11 9	13 7	16 1	17 8	16 11	7 6	18 11
March.....	17 6	18 7	14 8	20 8	13 4	17 6	15 6	13 4	16 1

CROPS AND MARKETS.

Index of Prices of Field Crops and Animal Products. (Basic period 1936-37 to 1938-39=100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Com- bined index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
WEIGHTS.	19	13	2	8	84	6	17	6	100
1938-39.....	92	109	96	89	79	102	166	94	98
1939-40.....	86	114	77	95	115	105	106	89	104
1940-41.....	108	120	106	156	102	103	110	103	109
1941-42.....	120	144	143	203	102	131	135	136	124
1942-43.....	160	157	144	159	122	147	163	167	147
1943-44.....	170	186	137	212	122	154	185	188	159
1944-45.....	183	186	160	231	122	177	179	184	164
1945-46.....	201	194	164	312	118	198	185	170	170
1946—									
January.....	198	194	191	347	118	204	183	204	174
February.....	198	194	158	305	118	186	184	224	171
March.....	198	194	160	280	118	186	181	241	171
April.....	198	194	176	298	118	186	180	279	174
May.....	249	194	170	284	119	186	177	289	184
June.....	246	194	178	287	119	216	178	260	184
July.....	245	194	182	303	120	231	183	193	182
August.....	242	194	181	319	120	231	183	164	181
September.....	243	194	183	351	163	231	196	156	193
October.....	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December.....	242	210	157	236	168	194	208	201	200
1947—									
January.....	242	210	144	174	178	194	200	238	202
February.....	240	210	127	157	187	194	191	243	208
March.....	240	210	154	158	189	194	182	251	203

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.

(d) Potatoes, sweet potatoes,
onions and dried beans.
(e) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and
condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1 July to 30 June).	CABBAGES (Bag). (a)			CAULIFLOWER (Bag). (a)			TOMATOES (Trays 15 lb.).			
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johannesburg.			
							N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.....	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 8	1 8	0 10
1940-41.....	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941-42.....	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942-43.....	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943-44.....	11 1	7 4	17 6	9 2	6 2	12 1	5 5	2 9	3 7	2 0
1944-45.....	9 7	6 11	18 5	7 5	6 6	9 8	4 1	2 0	2 10	1 9
1945-46.....	10 1	7 1	10 11	8 4	6 5	11 1	4 11	2 4	3 4	1 7
1946—										
January.....	9 7	8 0	14 8	14 5	9 0	—	4 3	1 10	2 5	1 3
February.....	7 3	9 1	18 1	10 10	6 6	—	4 2	1 7	1 11	1 3
March.....	8 11	7 3	14 4	7 2	9 8	3 4	6 3	3 8	2 6	1 6
April.....	9 10	5 8	9 0	6 7	15 4	12 4	8 1	3 6	2 8	2 0
May.....	8 4	3 4	7 7	7 2	5 3	8 11	6 3	2 11	3 8	3 3
June.....	5 10	2 4	11 0	7 7	3 1	12 1	4 2	2 0	2 10	1 5
July.....	7 11	1 10	9 9	8 6	—	11 8	2 2	1 1	2 3	1 0
August.....	5 3	2 1	7 1	8 9	3 2	11 1	2 5	1 3	1 11	0 9
September.....	4 11	2 5	5 8	9 6	4 0	13 7	3 2	1 9	2 2	1 1
October.....	5 6	8 0	7 0	15 10	13 7	12 0	4 5	1 9	2 8	0 11
November.....	5 7	11 5	12 0	13 4	15 1	—	5 2	2 1	3 4	1 1
December.....	8 9	9 11	11 11	11 10	—	—	4 8	1 11	3 0	1 10
1947—										
January.....	9 0	12 3	5 9	11 3	23 8	—	5 0	2 0	2 11	1 6
February.....	11 4	14 10	14 3	12 5	15 2	—	5 6	2 3	3 4	3 1
March.....	12 0	17 2	17 6	12 1	16 6	31 5	7 10	3 9	4 0	2 11

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 150 lb.; Cape Town, 106 lb.; and Durban, 90 lb. For cauliflower—Johannesburg, 100 lb.; Cape Town, 65 lb. and Durban, 55 lb.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.)			GREEN PEAS (Pocket 20 lb.)			CARROTS (Bag). (s)		
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.
1938-39.....	s. d. 1 8	s. d. 2 3	s. d. 2 0	s. d. 2 4	s. d. 1 9	s. d. 1 2	s. d. 3 8	s. d. 2 6	s. d. 6 1
1939-40.....	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1940-41.....	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 11	17 2
1941-42.....	3 1	4 3	3 0	3 3	2 10	3 0	5 1	8 9	13 2
1942-43.....	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1943-44.....	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1944-45.....	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1945-46.....									
1946—									
January.....	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February.....	1 11	—	2 3	6 5	—	6 4	7 3	7 11	14 1
March.....	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.....	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May.....	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June.....	1 10	2 0	2 3	4 8	4 1	5 7	4 2	7 6	11 7
July.....	3 2	1 11	2 2	2 7	3 6	3 4	3 3	4 8	7 10
August.....	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.....	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December.....	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January.....	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
February.....	4 2	—	5 1	3 2	12 2	5 8	10 4	—	12 8
March.....	3 5	—	2 8	5 3	10 5	7 5	16 8	20 0	24 5

(s) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Average Prices of Lucerne, Tef, Kaffircorn and Dry Beans.

SEASON AND MONTH (s).	LUCERNE (per 100 lb.).			Teff Johan- nesburg (s) 100 lb.	KAFFIROORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (s).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (s).		
	Cape.	Trans- vaal.			K1.	K2.	Speckled Sugar.	Cow- peas.	Kid- ney.
1938-39.....	s. d. 3 10	s. d. 3 1	s. d. 4 0	s. d. 2 7	s. d. 13 1	s. d. 12 9	s. d. 25 0	s. d. 16 9	s. d. 24 2
1939-40.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.....	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.....	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.....	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1945—									
January.....	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February.....	6 0	5 3	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March.....	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May.....	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June.....	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 8	40 8	69 2	34 5	56 6
November.....	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1946—									
January.....	5 10	5 11	7 5	3 8	43 9	43 9	61 4	33 11	51 4
February.....	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 3
March.....	6 2	5 10	7 5	3 11	40 8	40 8	47 1	35 1	49 3

(s) Municipal Market.

(s) Seasonal year for all-corn,
1 July-31 May.

Dry Beans, 1 April-31 March;

Lucerne and teff, 1 July-
June.

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D. J. SEYMORE Editor.

FARMING IN SOUTH ... AFRICA

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June 1947

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Editorial :

Changed Economic Relationships in Farming.

South African agriculture has passed through three war periods during the past half century. After each war it has had to re-adapt itself to peace conditions and changed economic relationships. The Anglo-Boer War was followed by a sharp decline in agricultural prices which, together with the problem of capital reconstruction, caused a very difficult readjustment. An improvement in the price level occurred, however, round about 1908. Land was also, relatively speaking, still plentiful and cheap so that a shift to a new farm could still take place reasonably easily.

During World War I economic relationships in agriculture were very favourable, with the result that agricultural production greatly increased. A larger and larger area of the country came under productive use and our agriculture finally switched over onto a full commercial basis. The self-sufficient character of our agriculture which in some cases still partly survived from the previous century, disappeared permanently during the first World War.

As farming becomes more commercialized and concentrated on specialized production for the market, it also becomes more sensitive to changed relationships in the economic network. Proof of this lies in the difficult times our agriculture experienced during the twenties, but especially during the first half of the thirties. The declining trend in agricultural prices since about 1920 up to more or less 1934 brought about many malrelationships, especially between farm indebtedness, land values, prices of products sold by the farmer, and prices of requisites bought by the farmer and used in the agricultural production process. On a rising price level the relationships between these factors are to a large extent in the farmer's favour. This has been the case since 1940 and up to the present.

At the time of writing the price trends are still upward. There is as yet no indication of even a flattening out of the price curve, far less any indication of a downward movement. No one can state for how long these favourable relationships will last. Economic history teaches us, however, that every war inflationary period is followed by a declining price structure or deflationary period. No facts are available which may change our views as to the probability of a recurrence of a downward price trend during the present post-war period. We must therefore expect a declining price structure sooner or later. With the aid of our control measures the decline will not be as severe as it was after the first World War, but a decline cannot be prevented. A declining price structure brings about malrelationships which are unfavourable to the agricultural producer. The more commercialized a farm is, the more it feels the effect of a declining price structure.

During the past seven years practically all the available farming area was brought into productive use, with the result that there is no longer any chance of escaping to "new" areas. What we have we

must keep. The period of further expansion to new areas has gone for good. A further important change which has taken place is in regard to our farm labour factor. It is a well-known fact that our agriculture was developed from the start on the basis of abundant and cheap labour. This era of a cheap and abundant labour supply is evidently a thing of the past, or at least is rapidly passing away. This means that a definite changed relationship has set in between the production factors labour and capital goods such as machinery and implements, and our agriculture will have to adjust itself to it. This adjustment is already taking place and will continue to do so during the following decade.

What are we to do now, especially if a downward price trend were to set in? In the first instance an attempt should be made to lower the individual farm indebtedness as quickly as possible. On a downward price structure the greatest pressure is encountered from the indebtedness. Fixed annual payments for debt and interest will have to come out of a diminishing farm income. Under such conditions the farmer is usually forced to malpractices which are not to the advantage of coming generations.

In the second instance it should be realized that profit per unit of product is the difference between cost of production on one hand and price received on the other hand. Price is certainly not the only medicine to keep the profit positive, although for the farmer it is the most pleasant. The cost of production is equally important. Just as there are various factors affecting the cost in a factory or ordinary business, so there are factors affecting the cost of production in farming. Remember that a farm is to-day as much of a business as, and perhaps even more intricate than, a factory or ordinary business. Productivity, i.e. yield per morgen, per tree or per animal unit, is one of the most important factors which determine the cost of production on the farm. Maintaining soil fertility and improvement of the herd are therefore two of the most important keys to permanent financial success. This naturally requires the ideal utilization of our land, whether grazing or under cultivation. More extensive use should be made of all possible information, and facilities placed at the disposal of the farmer by the Department of Agriculture. There are still so many farmers who regard technical advice on agriculture as unnecessary. Such an attitude will also have to disappear sooner or later.

Thirdly, the changed labour factor brings about a greater use of machinery and implements, in other words a higher investment in machinery and therefore an increased cost of this item relative to the total farming costs. This does not mean that such a changed relationship between the costs of these two factors of production will increase the total farm costs. On the contrary, it ought to bring about a lowering of the total costs, or at least an increase in profit. But it may have the opposite effect should the choice and purchase of the machinery not be thoroughly investigated and studied beforehand. A few surplus labourers can easily be disposed of, but after a tractor or combine or lorry has been purchased it is not so easy to get rid of it again except at a loss. Each farm has its own requirements in respect of the machinery and implements to suit its size and type. The capital goods owned and used on a particular farm are not sufficient reason for all the surrounding farms to acquire exactly the same mechanical outfit. In many cases the size of the farm will have to be readjusted to the minimum labour-saving machinery outfit in order to get the most productive use of such mechanical unit. Further subdivision of a farm at this stage should first be considered seriously in the light of further mechanization. There

The Bitter-Seville Rootstock Problem.

Dr. P. C. J. Oberholzer, Department of Horticulture, Agricultural Research Institute, University of Pretoria.

The Bitter Seville, also known as sour-orange (*Citrus aurantium*), was, up to a few years ago, the most widely used rootstock for citrus fruits in many of the older and most productive citrus regions of the world like California, Florida, Spain and Italy. In other parts of the world, however, notably South Africa, Java and parts of India, experience had shown that this species is a complete failure when



FIG. 1.—(1) Valencia orange (bud taken from a nucellar seedling) on Californian sour-orange rootstock. Rootstock two years and eight months from seed; scion approximately fourteen months after budding. (2) Identical with (1), but two Valencia orange buds (taken from a normal budded orchard tree) were inserted on 11th December, 1946. Note cessation of new growth, chlorotic leaf symptoms and leaf fall.

budded to sweet orange, mandarin and other species, with the result that other rootstock types had to be found, e.g. the rough lemon in South Africa. Experience in this country has further indicated that the commercial lemon (*C. limon*), certain acid lime types, and to a certain extent also the grapefruit (*C. paradisi*), behave more or less similarly to the sour-orange when used as rootstocks. Finally, no difficulty is experienced in producing healthy, productive lemon trees on the sour-orange rootstock⁽²⁾.

This apparent anomaly, especially as far as the incompatibility reactions of the sour-orange rootstock are concerned, has attracted considerable attention from physiologists and horticulturists, but was regarded more in the light of an "interesting phenomenon of incompatibility" until approximately 1931, when it suddenly came into the limelight with the discovery that sweet oranges, grapefruit and



FIG. II.—(3) Valencia orange (bud taken from a nucellar seedling) on Eureka lemon rootstock. Rootstock two years and eight months from seed; scion approximately fourteen months after budding.
(4). Identical with 3, but two Valencia orange buds (taken from a normal budded orchard tree) were inserted on 11th December, 1946. Note cessation of new growth and chlorotic leaf venation.

mandarins budded on sour-orange rootstock exhibited decline symptoms in parts of the Argentine, resulting in the death of many trees. A few years later, viz. in 1937, a peculiar "disease" termed "Tristeza" was reported from parts of Brazil, where, according to reports so far received, many millions of sweet-orange trees budded on the sour-orange rootstock have been completely destroyed. More recently, i.e. during the early part of 1944, it was reported from California that a somewhat similar "disease", now termed "Quick Decline", was taking a fairly heavy toll of sweet-orange trees budded on the sour-orange in certain districts. Since recent reports⁽¹⁾ from California indicate that "Quick Decline" is probably caused by a virus, it may be of interest to report briefly on results obtained by the writer in studies pertaining to the peculiar behaviour of the sour-orange and other citrus species when used in certain stock-scion combinations. It is hoped to publish at a later date a detailed report on all the investigational work which was commenced during 1937. This article therefore deals mainly with the results of experiments conducted in Pretoria during the past few years.

In view of the persistent failure to obtain normal growth of certain stock-scion combinations of citrus (e.g. sweet-orange on sour-orange rootstock) in soil, sand and solution cultures, the author

THE BITTER-SEVILLE ROOTSTOCK PROBLEM.



FIG. 111.—(A) Valencia orange (bud taken from a normal budded orchard tree) on Californian sour-orange rootstock which was grown in complete nutrient solution (aerated water-culture) one year prior to budding. Rootstock approximately two years from seed; scion approximately one year after budding. Note poor scion growth and extensive decay of fibrous root-system.

(B) Eureka lemon (bud taken from a normal budded orchard tree) on Californian sour-orange rootstock grown under similar conditions as described under (A). Note healthy scion and root growth.

concluded, partly as a result of the suggestions made by Bitancourt and later by Webber⁽³⁾, that the problem of "incompatibility" may be of a pathological, rather than nutritional, nature. The possibility of a virus being the causal agent received the first attention, and in this connection the following basic principles were applied in the experimental procedure, viz.:—

I. A particular virus, although "systemic" throughout the tissues of the host plant, is, *as a general rule*, not readily transmitted by the seed.

II. In view of the well-established principle of "nucellar embryony" characteristic of the genus *Citrus*, it is possible, by means of seed propagation, to maintain the inherent genetic constitution of a particular variety simply by eliminating the "sexual variant" by relatively simple and well-known methods. By combining these two fundamental principles, it becomes possible to obtain rootstock and scion material free of a particular virus, and hence to obtain, theoretically at least, normal growth of so-called incompatible combinations, i.e. if a virus should be the underlying cause of incompatibility. (As far as the writer is aware, the value and importance attached to the phenomenon of "nucellar embryony", characteristic of the genus *Citrus*, have thus far been confined almost exclusively to the question of rootstock selection. The possibility of applying this principle also to the scion-variety, especially as regards the elimination of virus diseases, has apparently been entirely overlooked.) The results of carefully planned experiments conducted in the glass-house, where plants have been kept reasonably free from insects (except the occasional appearance of red spider), confirm this hypothesis, and are briefly as follows:—

(a) Healthy, vigorously-growing Valencia scions on sour-orange, lemon and grapefruit rootstocks, as well as Triumph grapefruit scions on sour-orange and lemon rootstocks, have been obtained by taking budwood from nucellar seedlings of the particular scion-variety [see figures I(1) and II(3)]. (All these combinations have proved to be more or less incompatible under ordinary nursery conditions.) Most of these budded trees are already over one year old and, besides being exceptionally vigorous, exhibit no signs whatever of disease. If budwood be taken from orchard-trees of the same scion-varieties, the young budlings exhibit extensive root decay, chlorosis and general decline at a very early age (generally 1 to 3 months after budding), and result in straggly, miserable, diseased plants [see figures III(A) and V(D)].

(b) Healthy plants obtained under (a) can be induced to stop all new growth, followed soon afterwards by chlorotic leaf symptoms and almost complete destruction of the entire fibrous root system simply by inserting buds of the respective scion variety, taken from apparently healthy budded trees in the orchard, into the rootstock or scion. [See figures I(2) and II(4).] The symptoms of decline associated with such treatment are fairly similar to those ordinarily obtained in the nursery, i.e. when buds are taken directly from an orchard tree and inserted into the particular rootstock.

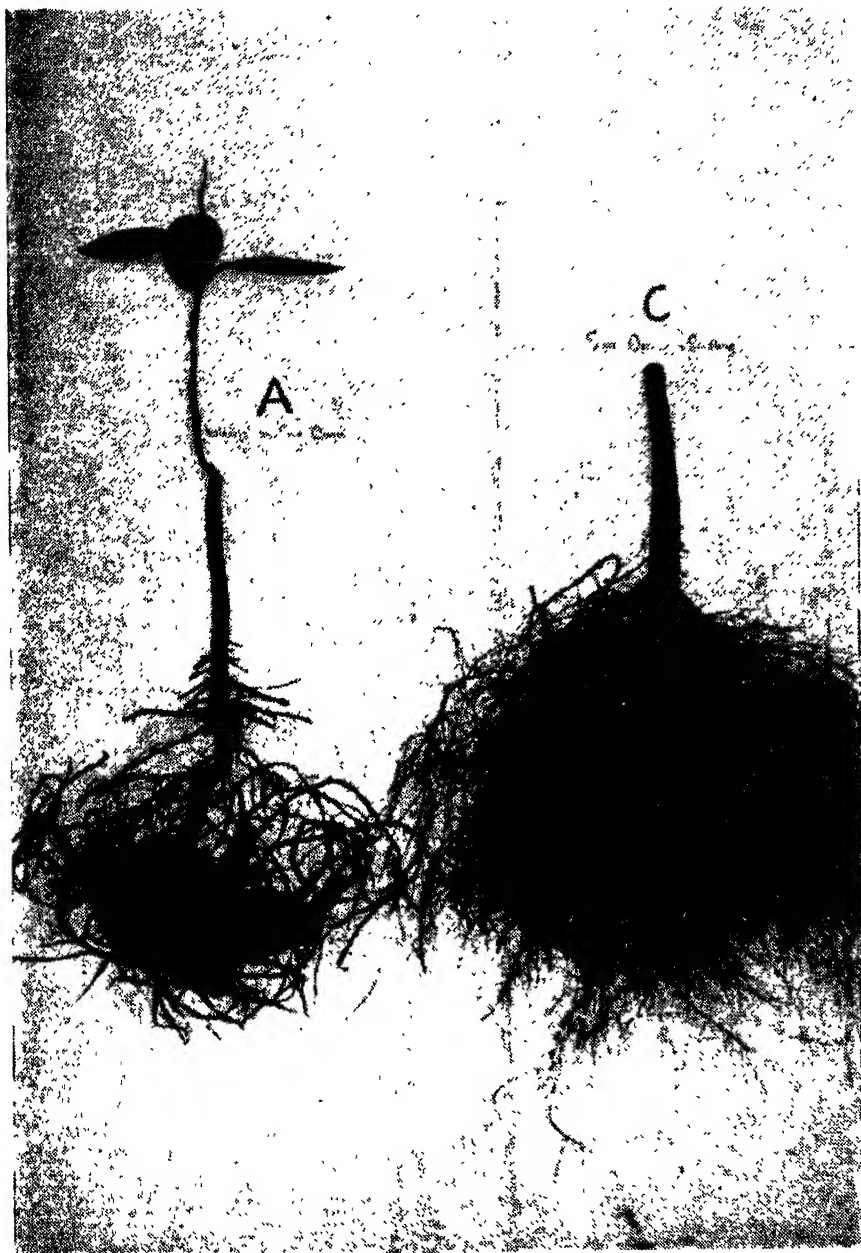


FIG. IV.—(A) Valencia orange (bud taken from a normal budded orchard tree) on Californian sour-orange rootstock which was grown in complete nutrient solution (aerated water-culture) one year prior to budding. Rootstock approximately two years from seed; scion approximately one year after budding. Note poor scion growth and extensive decay of fibrous root-system.

(C) Unbudded Californian sour-orange seedling grown under conditions similar to those described under (A). Note large, healthy root system (top removed when photographed).

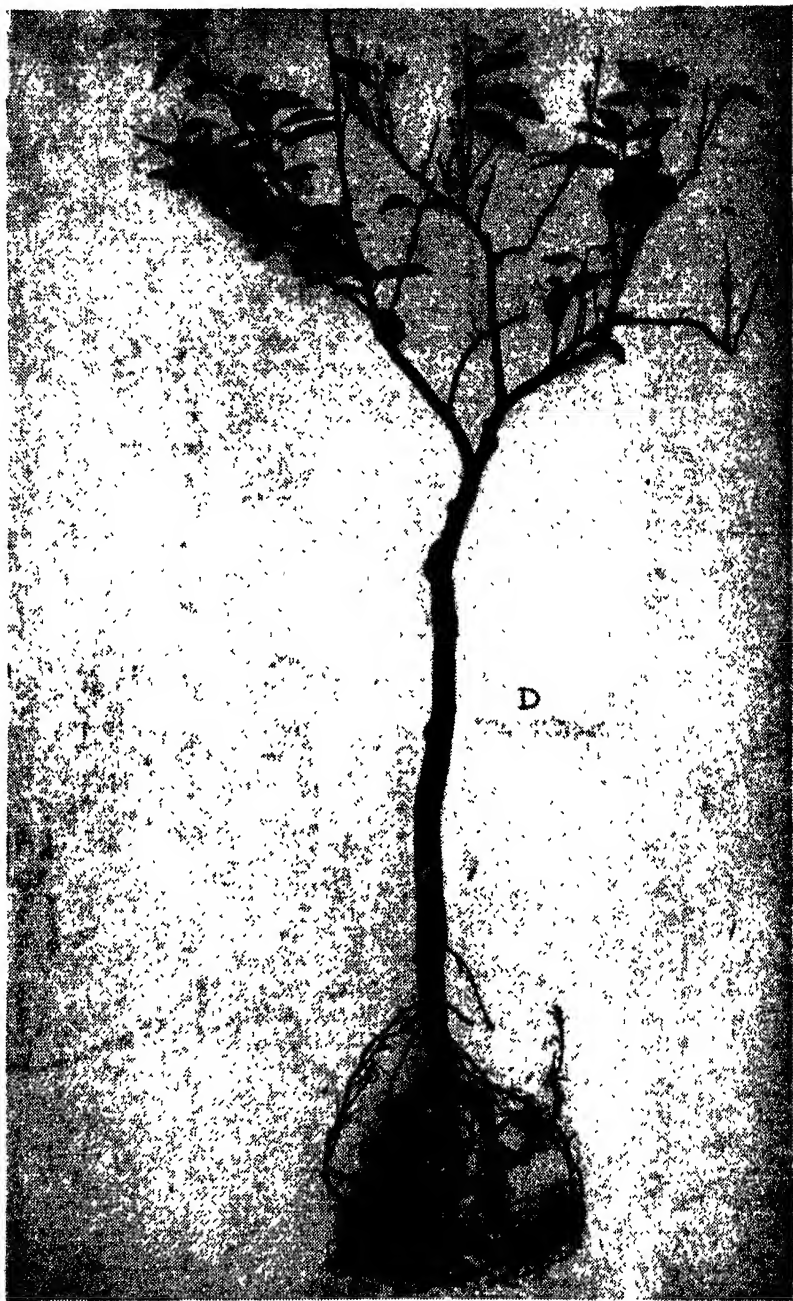


FIG. V.—(D) Valencia orange on Californian sour-orange rootstock transplanted from the nursery and kept “alive” in aerated water-culture for approximately five years. Age of rootstock approximately eight years; age of scion approximately six years. Note poor topgrowth and lack of healthy fibrous roots. [Photographs 1, 2, 3 and 4 by E. King, courtesy Dr. A. P. D. McClean (April 1947); A, B, C, and D originally by Prof. M. G. Mes. University of Pretoria (May, 1946), and enlarged by E. King, courtesy Dr. A. P. D. McClean, Division of Botany and Plant Pathology. Dept. of Agriculture].

Conclusions.

While it is realized that further evidence is needed before final conclusions can be drawn, the results obtained nevertheless prompt one to suggest the following tentative hypothesis:—

1. The incompatibility reactions exhibited by certain stock-scion combinations of citrus in South Africa are probably caused by a virus, which is present in a latent form in certain species or varieties (e.g. Valencia orange), and only causes pathological conditions when certain stock-scion combinations are made.

2. Preliminary results indicate that such a virus is satisfactorily (if only temporarily) eliminated by taking the infected, but apparently healthy, scion variety through the seed, making use of the well-established principle of "nucellar embryony" characteristic of the genus *Citrus*. By using buds from such nucellar seedlings, healthy and exceptionally vigorous budlings have been produced of hitherto incompatible combinations, e.g. Valencia orange on sour-orange and lemon rootstocks. Provided infection does not take place mechanically, or by means of an insect vector, such plants will probably continue to make healthy growth.

3. The insertion of buds of the particular scion-variety (e.g. Valencia orange), taken from a normal budded orchard tree, into such healthy budlings causes infection within a relatively short time, resulting in the typical symptoms of decline, root decay, etc. This tends to indicate that the virus is readily transmitted by budding.

4. Finally it would appear, from experience and general information available, that the incompatibility reactions found in South Africa, Java and parts of India, especially as far as the sour-orange is concerned, probably bear a direct relation to the problems of "Tristeza" and "Quick Decline", and that the underlying cause in each case is probably a virus. Furthermore, experience in South Africa and elsewhere strongly suggests that this virus is infectious, being distributed by other means as well as by budding.

ACKNOWLEDGMENT.—The writer is indebted to Dr. J. D. J. Hofmeyr of the Department of Genetics, Agricultural Research Institute, for his continued interest in this work, and for many helpful criticisms and suggestions. His views regarding the dangers of accumulation of degenerative diseases as a result of continued vegetative propagation of horticultural plants have had an important bearing on the whole trend of thought pertaining to the investigational work reported on in this article. Appreciation is also expressed to Professor B. J. Dippenaar, Dept. of Plant Pathology, Agric. Res. Institute, for his encouragement, as well as for the benefits derived from personal discussions regarding the seed-transmission of virus diseases.

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Groundnut Seed.

THE demand for oil-bearing seeds has created considerable interest in the availability of groundnut seed. Consequently, the Department of Agriculture, the Directorate of Food Supplies and Distribution, co-operative societies, seed merchants and producers are receiving numerous inquiries regarding the immediate delivery and reservation of seed. However commendable the practice of making early provision for seed may be, it should be pointed out that it is inadvisable to supply groundnut seed until about September. The agents of the Directorate of Food Supplies have to take delivery of a groundnut crop twice as large as any hitherto grown in the Union. The greater part of the supplies that are in excess of our seed requirements must be shelled and delivered to the oil factories which are short of groundnuts. Only when a large portion of this material has been despatched, can sufficient attention be devoted to the shelling, preparation and selecting of seed.

Groundnuts should not be planted until the danger of frost is over. Even in frost-free areas planting may well be delayed until September. Experience and investigations have shown that in general groundnut seed should not be shelled too long in advance of planting time, unless it is kept under cool conditions.

As was the case last year, provision is again being made for the reservation of an ample supply of groundnut seed. The conditions under which the seed will be obtainable, and from whom, as well as particulars regarding prices, quantities, sizes and varieties available, the need for permits and whether seed loan schemes will again be in operation, will be announced in the press towards September next. Recent references in the press to a groundnut seed loan scheme referred to that in force in certain districts from September to December 1946. To facilitate seed distribution in general, regular groundnut growers would do well to reserve their seed requirements from their own stocks.

As important as the seed itself is the need for treating it with a suitable seed protectant. Seed protectants are advertised in the agricultural press throughout the year. In view of the fact that most of our soils are well supplied with the groundnut plant root-nodule bacteria, the inoculation of this seed is, as a rule, not recommended. Moreover, protectants and inoculants cannot be used on the same seed. As far as possible, seed protectants should be applied very thoroughly, and preferably by means of a revolving drum or other mechanical apparatus. D.D.T. is not a fungicide and should therefore not be used as a seed protectant on groundnuts.

(Department of Agriculture.)

The Influence of the Milker on Milk Production.

C. P. Greyling, Lecturer in Dairying, Grootfontein College of Agriculture, Middelburg, Cape Province.

THERE are about twenty different known important factors affecting the quantity or the chemical composition of milk. It is up to the farmer to feed his cows on an adequate and balanced ration, but apart from this, there is not much he can do to control most of these factors. One factor, however, which can be controlled and in respect of which there is room for improvement in South Africa is impairment of the milk by the milker; who by being indifferent to his cows, ill-treating them or applying wrong methods of milking, may cause the cow to withhold her milk, and thus yield less. Such small quantities of milk as are produced in these circumstances are usually low in milk fat. The last few draws from the udder very easily contain as much as or even more than 10 per cent. milk fat, and it is precisely this milk which is often left by too hurried milkers, who draw the fore-milk only.

It often happens that milk is drawn by milkers who are in an inebriate condition or who are lazy or in a hurry and at such times the udders are not properly emptied. In such circumstances less milk and milk with a lower fat content is obtained. These factors all conduce to financial loss to the farmer, because of the lower butterfat content. The butterfat content of milk or cream to-day usually constitutes the basis on which the price of milk or cream is fixed in South Africa.

In order to control this adverse influence of the milker, it is desirable that the milking of a certain group of cows should be assigned to one milker. This system would serve a double purpose: the cows would grow accustomed to the milker and at the same time a better check could be kept on the milker himself. If, for instance, through being in a hurry, he drew very little milk, it would immediately be noticed. Even in those cases where milking-machines are used, it is desirable that the same person should always attach the instrument to the same cow and, if necessary, perform the final milking.

Another respect in which the milker plays an important rôle is the contamination of milk, particularly with disease germs. A study of the statistics on typhoid epidemics will reveal that most of these epidemics are due to the ingestion of contaminated milk and that contamination is usually caused by a so-called carrier of typhoid who at some time or other has handled the milk. About four per cent. of recoveries remain carriers of the disease and may spread the disease on a large scale. There are various ways in which a milker is likely to contaminate the milk. Germs may be carried by the hands, the mouth, nose or throat. Old clothes, too, are a possible source of infection. Germs land in milk when the milker talks, coughs, sneezes or whistles over the milk in the pail into which it is being drawn, or over milk standing uncovered. Germs from these sources are often pathogenes and may cause a septic throat or some other disease in persons drinking the milk. In the milk byre, talking should be limited to a minimum and where the milker cannot avoid sneezing, talking and coughing, he should turn his face away from the milking pail or any milk standing uncovered.

Milk should never come into contact with the hands of the milker, for if it does, it will tend to wash off dirt and germs into the pail. Before starting to milk, the milker should wash his hands thoroughly and also his forearm to above his elbow. Washing the hands alone, is not sufficient, since the forearm continually moves over the pail, and germs as well as dirt are liable to drop into the milk. It is from the hands or forearms that the germs of typhoid usually find their way into the milk.

Furthermore, every time before milking a fresh cow, the milker should wash his hands with soap, as the latter is an antiseptic. A damp, dirty towel affords a good breeding place for germs and if the hands are wiped with such a cloth, millions of germs are conveyed to the hands and may find their way into the milk. If no clean towel is available, rather do not use one at all.

Where cows are milked dry, a cheap, good vaseline should be used for smearing the teats. The vaseline should not impart any taint to the milk and should be kept in a clean spot so as to obviate the accumulation of dust, dung and other dirt in it. The dirty habit displayed by some milkers of dipping their fingers in the milk for wetting the teats, should be avoided at all costs. In order to prevent contamination from clothes it is desirable to keep special white overalls for milkers. These overalls should be kept neat and taken off immediately after milking.

The following are a few of the most important diseases the germs of which may be conveyed from the milker or person handling the milk, through the milk: Typhoid, dysentery, septic throat and food poisoning. The germs of all these diseases, and also others which do not produce disease but are, nevertheless, harmful as regards the keeping quality of milk or products manufactured from milk, are capable of multiplying in the milk to a greater or lesser extent and of thus rendering it unsuitable for human consumption.

Changed Economic Relationships in Farming :—

[Continued from page 488.]

already exists a large percentage of uneconomic farm units, too small to make the most efficient use of their "mechanical unit". In such cases the cost of production is automatically higher than on farms of a more economic size.

The change that has taken place in the labour factor of production, namely shortage of labour and higher wages, also brings about the necessity of improved farm lay-out in South African agriculture, a problem which has hitherto received relatively little attention. The situation of the farmstead in relation to the whole farm and also the relation to each other of the various buildings on the farm leave much to be desired on many of our farms. Every year hundreds of miles are walked unnecessarily on many farms because of a poor lay-out and uneconomic arrangement of buildings. Such unproductive use of the labour force does little economic damage when labour is plentiful and cheap, but the picture is altogether different when labour becomes scarce and high priced, as will be the case in future and is to a large extent already at present.

Finally just this: Circumstances will demand from farmers in future a greater technical and economic knowledge of farming. If at all possible, the son who is to take over the farm, should be sent to an agricultural college or university in order to equip himself properly for the task that lies before him.

(Dr. F. R. Tomlinson, Agricultural Research Institute, Pretoria.)

Fibre-Yielding Wild Stock Rose.

Miss I. C. Verdoorn and D. G. Collett, Division of Botany
and Plant Pathology.

THE "wild stock rose" has attracted considerable attention recently as being the most promising of the indigenous fibre-yielding plants. Farmers have naturally become interested in the species and may find the following description and plates useful in enabling them to identify it.

The plant is an erect *annual* about 5 to 12 ft. tall.

Main stem rigid, erect, with or without lateral branches which are usually shorter than the main stem; main stem and branches prickly with short sharp points which are often red.

Leaves rather distant on the stem with stalks up to 8 cm. long and spreading stiffly at right angles from the stem, blades deeply palmately 5 to 7-lobed (sometimes with more or fewer lobes); lobes up to about 8 cm. long and 2 cm. broad with the margins coarsely serrate and a gland at the base of the middle lobe, glabrous or with a few inconspicuous hairs on the nerves below, leaf stalk with a few prickles and minute hairs.

Flowers borne in the axils of the leaves in the upper portion of the stems and branches (flowering portion becomes up to several feet long), developing from below upwards so that on top is the youngest bud, a little way down an open flower (usually only one open at a time), and below it the developing fruit, the corolla having fallen. *Flowerstalk* very short, up to 1 cm. long, rather stout and prickly. *Involucre* at base of flower like a frill of (usually) 7 green, narrow-pointed, spreading lobes, dorsally hairy with broad-based diaphanous hairs and in the young stage sometimes also woolly. *Calyx* 5-lobed, lobes ovate-acuminate, enclosing the bud, appressed to the base of the corolla in the open flower, and closing over the fruit after the corolla falls, usually with red raised dots (the thickened bases of the hairs) below and along the margins, and having a thick green keel with a gland about half way up the lobe. *Corolla* with 5 obovate, crinkly lobes about 4.5 cm. long (1½ inches), pale sulphur-yellow with a deep crimson patch at base inside shading into a dark, deep bluish violet. *Stamens* united into a column, purplish crimson; pollen dull yellow. *Ovary* globose, pointed, bristly with appressed hairs, 5-celled with many ovules in each cell.

Seeds sub-glabrous, bluntly pointed at the base, broadly rounded at the top with 3 to 5 flattened sides.

Distribution.

The common name "wild stock rose" is to-day very generally applied to *Hibiscus cannabinus* and a closely related species which is most probably *Hibiscus diversifolius*. Both these species occur in the Transvaal and Natal. *Hibiscus cannabinus* is also known as Deccan hemp, Ambari hemp, Gambo hemp, Bimlipatum jute and wild hollyhock. It is a well-known fibre plant of India and, as well as occurring in the Transvaal and Natal, may be found in Bechuanaland and South-West Africa, extending northwards into Central Africa.

Over its wide range of distribution the species naturally varies in some respects such as size of plant and colour of flowers, but in general it is characterized by the tall, rigid main stem and very short rigid flower-stalk, by the hard, sharp prickles on the stems, branches and stalks, the hard red, raised dots on the calyx, the rather long stalk of the leaf standing out stiffly from the stem, and the leaves which are palmately lobed almost to the base. It might be mentioned that the lowest and uppermost leaves are generally entire, the former orbicular, the latter linear-lanceolate in shape.

The other species [*Hibiscus diversifolius*?] is very like *H. cannabinus* in appearance and is apparently more common in the Transvaal. The main stem and branches, however, are more prickly and more hairy than in *Hibiscus cannabinus*, and the leaves, instead of being lobed almost to the base, are only lobed about half-way down or a little deeper. The lobes, too, are fewer and broader. Other points of distinction are that the gland on the calyx is far less prominent than in *H. cannabinus*, which also has a light green foliage with green stems, whereas *H. diversifolius*? has darker green leaves with purple leaf-margins and nerves, and purplish stems and petioles. It is less branched than *H. cannabinus* and may therefore prove to be more suitable for fibre production.

Seed Collection.

The Manager of the Waterberg Farmers' Co-operative Society, P.O. Box 29, Nylstroom, will give information about purchasing seed of both the above species and collectors are advised to communicate with him in this connection.

The total production of fibre from these plants for this season would be too small to warrant its processing for commercial purposes. The decortication of the plant can only be economically achieved on a large scale. The gathering of seeds, therefore, will be of major importance for a few seasons with a view to cultivating the plant on a commercial scale.

In connection with the harvesting of *Hibiscus* seed the Department of Commerce and Industries has supplied the following information, received from their Industrial Liaison Officer, Washington: Frost causes the seed pods to crack open, resulting in loss of seed, although light frost will not damage the seed to any extent. The likely time to harvest in the Waterberg area, therefore, would be through the second half of May to the first half of June, the idea being to postpone harvesting as long as possible without incurring frost damage.

The seed is harvested by hand. It is cut with a knife and the stubble is left high, usually 1 to 2 feet, the plants being cut just below the first seed limbs. The seed shatters easily and it is best to cut the seed on cloudy days or during the forenoon, when the moisture will tend to prevent loss of seed by shattering.

Some of the best growers bind the plants in small bundles before putting them in shocks. This tends to hold the seed which shatters out. The plants, when harvested, are set up in large shocks around a saddle of four uncut stalks bent over and tied to prevent the shock from being blown down. After the shocks are completed they are tied with binder twine, for if the plants blow down, a very large proportion of the seed will be lost.



Fig 1—*Hibiscus cannabinus* L



Fig 2—Hibiscus sp cf *H diversifolius* .



FIBRE-YIELDING WILD STOCK ROSE.

Thrashing.

The seed is thrashed as soon as the plants are thoroughly dried in the shock. Three to five days are usually required for the plants to dry in the shock, but it is best to thrash as soon as possible to avoid waste.

While moist weather is desirable for harvesting, dry weather is absolutely necessary for thrashing.

The seed is beaten off on a canvas spread on the ground. Stubbles are cut down and a space cleared next to a shock or between two or more shocks on to which the tarpaulin is spread. The stalks forming the saddle of the shock are cut and the entire shock is tipped over on to the tarpaulin. Men then beat off the seed with sticks. A swinging motion of the stick, so as to slide along the stalks in the direction of the tops, gives the best effect. When the seed on the upper side is beaten off the shock is rolled over with the sticks and the seed beaten from the other side. Then the entire shock is thrown off. The men handle the stalks entirely with their sticks and do not touch them with their hands except to throw the shock on to the tarpaulin.

The Cleaning and Storing of Seed.

The chaff and the seed beaten off is first put through a large, coarse sieve and then through a fanning mill. Most of the seed is recleaned with power fanning mills at the warehouses of the local seed dealers.

No special conditions are called for in the storage of the seed. The same principles of low temperature, dry conditions and suitable ventilation that apply to the storage of cereals, also apply here. It is known that storage in metal containers in the sun adversely affects the seed.

Plate 1.—*Hibiscus cannabinus*.

1. Terminal portion of a branch showing one open flower with buds above and one young fruit below.
2. Flower, side view.
3. Young fruit with calyx and involucre (natural size).
4. (a) Immature seed ($\times 3$).
(b) Mature seed ($\times 10$).
5. Whole plant much reduced (this plant was young and so not as tall and branched as usual and the flowering portion not as long as usual).

Plate 2.—*Hibiscus diversifolius*. (?)

1. Terminal portion of a branch showing one open flower with buds above.
2. Flower, side view.
3. Young fruit with calyx and involucre ($\times 3$), showing nectar drops exuding from the glands on the calyx.
4. Mature seed ($\times 10$).
5. Whole plant much reduced, showing the purplish tinge to the main stem, branches and petioles.

The Treatment of Incubator Eggs.

P. E. F. Jooste, Lecturer in Pou'try, Grootfontein College of Agriculture, Middelburg, C.P.

SINCE poultry farming consists of various branches and the success or profitability of the undertaking as a whole depends on the success of *all* the individual branches, each should receive proper attention—and a few even special attention. In this connection we think of incubator eggs which do not always seem to receive the special attention which they merit.

As a rule, the selection of breeding pens is carried out very carefully. Vigorous cocks and hens are mated (a) for obtaining a high percentage of fertile eggs, and (b) for breeding strong and healthy chicks. In spite of this, however, the breeding results are often disappointing. The reason may be that the cocks or hens do not possess that quality which ensures a high hatchability. There are, however, other factors underlying infertility, among which the following may be cited:—

- (1) Lack of desire for mating in certain hens.
- (2) Disturbances amongst cocks or hens in breeding pens, as a result of fighting.
- (3) A disproportionate number of hens to that of cocks.
- (4) Preference for certain hens on the part of cocks.
- (5) Infertility in cocks or hens.
- (6) Incorrect feeding.
- (7) Diseases such as colds, vent gleet, etc., amongst breeding birds.

The Testing of Cocks and Hens.

By making use of trapnests, the eggs of each hen may be marked and the hatchability of her eggs determined. To ascertain the influence of cocks, each cock should be mated with his group of hens in a separate run or house. This system requires more work, but is essential for maintaining the good qualities of a flock and breed according to such qualities.

Here is an example of what happened with various matings:—

Cock No.	Hen No.	Number of eggs placed in incubator.	Number of infertile eggs.	Dead embryos.	Dead in shell.	Healthy chicks.	Percentage hatched.
715	233	58	3	6	5	44	75·8
3500	233	8	1	2	3	2	25·0
4555	2649	34	—	6	4	24	70·5
3500	2649	24	2	5	7	10	41·6
3500	9630	11	11	—	—	—	—
4555	9630	9	1	—	1	7	77·7

The number of hens handled was probably insufficient, yet the figures show that cock No. 3500 yielded very poor results when mated with hen No. 9630 and even with No. 233. Since all the eggs of hen No. 9630 were infertile, the reason may be that the hen would not mate with No. 3500, or vice versa.

THE TREATMENT OF INCUBATOR EGGS.

Temperatures.

Before a fertilized egg is laid, cell division has already taken place, since the egg has been subjected to a temperature of $\pm 107^{\circ}$ F. in the body of the hen for at least 18 hours. As soon as the temperature of the egg drops to below 68° F., however, cell division ceases. Nature protects this embryo, which has already undergone a period of growth, by covering it with a layer of thick white. It remains for man to lend a hand to assist nature.

Our country, especially the interior, is subjected to great extremes of temperature. During the night in the middle of winter, it is nothing exceptional for the temperature to drop to below 38° F. If the embryo is kept at this temperature for any length of time, it dies. If the temperature rises to 68° — 70° F., it develops slowly and becomes very weak. Care must therefore be taken that the temperature of the room in which the eggs are stored, remains between 50° and 60° F.

Duration of Storage Period.

The hatchability of an egg is in direct proportion to the period of storage, the reason being that the evaporation of moisture from the egg and also from the inner and outer shell membranes, not only hampers the normal intake of oxygen, but also the giving off of carbon dioxide. (The former gas is vital to the growth of the embryo, whereas excessive carbon dioxide has a very detrimental influence.) Eggs must be as fresh as possible when placed in the incubator; 10 days is regarded as the maximum. The necessity for a dormant period which is often advocated, has not yet been proved. If eggs, especially incubator eggs which have been transported over long distances, need rest, they should rather lie dormant in the incubator. Note the following results obtained in an experiment:—

Age of eggs. Days.	No. of eggs.	No. of cracked eggs.	Infertile.	Dead embryos	No. of chicks	Percentage of chicks.
30	96	—	50	23	23	24.0
26	96	1	22	31	42	44.2
22	120	1	17	34	58	48.7
18	120	—	15	36	69	57.5
14	96	2	11	30	53	56.4

Selection of Incubator Eggs.

It has been found that abnormally large eggs do not hatch well. Those weighing from 2 to $2\frac{1}{4}$ ounces are most suitable for hatching purposes. In no circumstances should misshapen eggs or eggs with thin shells be used, for not only do they not hatch well, but the bad property of laying such eggs, is transmitted to the progeny. See that the shells are free from very fine cracks since such eggs easily break when they are turned in the incubator, and do not hatch.

The Turning of Eggs.

The turning of eggs during the storage period is of paramount importance. The embryo on the yolk of the egg floats in the white. Normally it cannot come into contact with the shell membrane since

it is surrounded by a layer of thick white, but since a large proportion of the yolk of an egg consists of fats, the yolk is continually inclined to rise and eventually to come into contact with the shell membrane. As evaporation progresses the embryo begins to adhere to the shell membrane, with fatal results. If the eggs are turned regularly, the yolk shifts around and more white comes between the yolk and the shell membrane.

The easiest method of turning eggs kept for hatching purposes is to pack them in a clean box with clean fillers and flats and then to turn the box daily, leaving it on its base one day, on its side the next day, on another side the next, etc. It stands to reason that if the box is not full, it must be filled with empty fillers and flats.

The Washing of Eggs.

The bloom on a newly-laid egg serves as a protection to the contents of the egg. As soon as the egg is washed or rubbed, this bloom is destroyed. According to experiments with 400 incubator eggs of which half were washed, it was found that the unwashed eggs hatched $12\frac{1}{2}$ per cent. better. If one of the eggs in a nest breaks and dirties the others, the dirty eggs will hatch out poorly, if at all. The only expedient in such a case is to wash the eggs if they are to be used for hatching purposes. Dirty eggs can be avoided, however, by providing sufficient nests—at least one for every 5 hens. Put dry, clean straw or other material in the nests and remove the eggs two or three times a day. Broody hens must not be allowed to sleep in the nests at night.

During the past year there was an unprecedented demand for day-old chicks, pullets and incubator eggs. Sellers must regard it as their duty to sell only their best products and buyers must make sure that they receive only the very best. Breeders who make use of trapnests and pay careful attention to quality and size of the egg, vigour and high hatchability, etc., are entitled to better prices

Change of Date of Short Courses— Stellenbosch-Elsenburg.

The date of the short course in Home Economics which should have been held at the above College from 30 June to 4 July 1947, has been changed to 29 September to 3 October 1947.

This alteration has been made to meet requests from several branches of the Women's Agricultural Association.

The Horse on the Farm.

Part VI.—The Production, Improvement and Registration of Horses.

Dr. P. J. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

THE horse is the aristocrat of the animal kingdom and a jewel among domestic animals. Not only has he rendered great utility services to mankind throughout the ages, continuing to do so to-day, but he has also always been closely associated with the ways of life and social status of individuals, in witness of which we have the chevaliers and knights who for many centuries were the recognized leaders of men and civilized society.

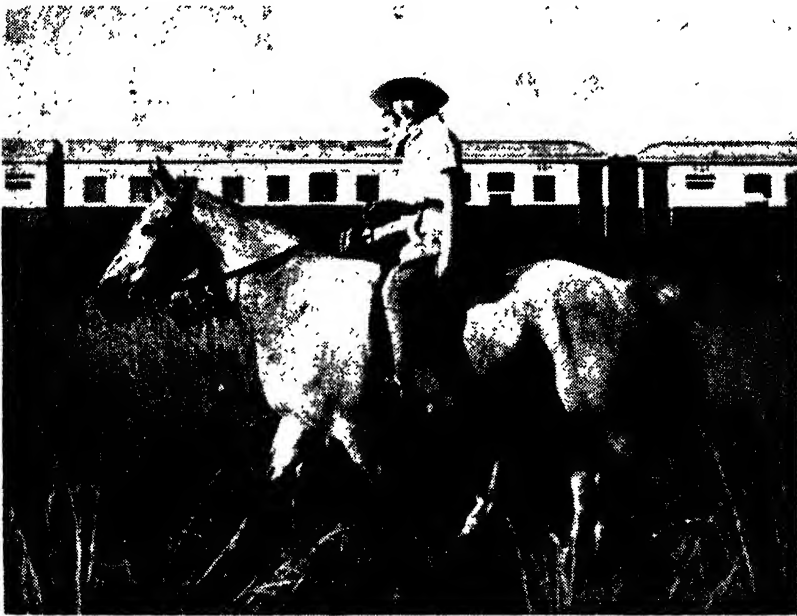


FIG. 1.—H.R.H. Princess Elizabeth enjoying a ride during the South African tour.

The companionship of master and mount instils a deep love and moulds a way of life with cultural values that no mechanical contraption can ever do.

The boy who learns that "his horse comes first", learns the most important lesson in successful livestock farming.

Riding Clubs.

One cannot recommend too strongly the establishment of riding clubs in urban and rural areas. Such clubs can afford a great deal of pleasure and benefit to young and old, and offer unrivalled opportunities for "getting together" at healthy and instructive meetings. These clubs may organize sports and gymkhanas, horse training lessons, lectures on equitation and horsemanship, and cross-

country rides to study soil reclamation works and pasture improvement schemes or to inspect crops. Little local shows may be organized in preparation for larger events, while riding club members may advance to *polo clubs*.

Riding clubs are training grounds for more serious enterprises, namely, the establishment of studs or horse improvement schemes.

Horse Improvement Measures.

In various countries there are different schemes for the improvement of horses, often State-aided but also largely operated by private enterprise. The most common method is the *premium sire scheme* in which a committee of horse breeders in co-operation with a Government department selects stallions and pays a premium or subsidy; such selected stallions are then at the disposal of horse breeders in prescribed districts or areas and make their rounds to applicants' farms. These "travelling stallions" have contributed very largely to the improvement of the horse stock of countries operating such a scheme.

We find this scheme most productive of satisfactory results in countries where promotive and protective legislation is in force along the lines known to us in the Cattle Improvement Act. In some countries the State maintains large studs for the benefit of breeders and also for the production of horses used in Government service. The U.S.A. and several other countries maintain large remount stations in order to secure an assured supply of good horses for State services.

In the Union the S.A. Police maintains a large stud of 20 stallions and several hundred mares to help keep the mounted police adequately supplied with good animals.

Government Studs.

Since the earliest days the Dutch governors of the Cape and their successors maintained large studs for the improvement of the country's horse stock.

Shortly after the war of 1899-1902 the Transvaal and Orange Free State government established large studs to help rehabilitate the depleted and deteriorated horse stock. These studs were forced to close down when the first wave of motor-mindedness of the twenties caused farmers to lose a correct perspective of the place of the horse in the farming industries of the Union. State horse-breeding operations were confined to the agricultural colleges where small studs of draught horses—first Clydesdales and then Percherons—were maintained.

When horse-breeding interests revived in the thirties, the Government once again instituted a horse-improvement scheme for the benefit of farmers, and stationed additional stallions at the agricultural colleges and certain experiment stations. This scheme has shown progressive improvement since its inception in 1939, just before the beginning of World War II. To date 1,402 mares have been served by Percheron and Thoroughbred stallions, and also a small number of jennies by registered stud jacks. The scheme was handicapped by restricting war conditions but the stimulus given to horse-breeding by the insecure position of mechanized power assured increasing support for the scheme.

The present-day demand for good utility types of farm-work and riding horses and larger, stronger mules is such that the continuation and extension of these improvement measures will be most helpful towards a rehabilitation of this branch of our pastoral industries.

THE HORSE ON THE FARM.

Horse Breeders' Societies.

The revival of interest in equine affairs noticeable in the thirties has manifested itself in various practical forms. In addition to the Government reintroduction of stud services for farmers, farmers themselves have become more articulate and active. Old stalwarts and other breeders gathered in conference and established the first horse breeders' societies.



FIG. 2.—A Free State lass on a big Arab.

The Horse and Mule Breeders' Society of S.A. established in 1937 and operating as a commercial and propaganda body for the improvement of our equine stock became the parent body of other societies, some of which are now functioning under the protection and control of the Registration of Pedigree Livestock Act No. 22 of 1920.

The Percheron Horse Breeders' Society of S.A. was founded in 1939, and the Clydesdale Horse Breeders' Society of S.A. in 1946. Both Societies are affiliated to the S.A. Stud Book Association under the above Act. Light-horse breeders promote their interests through the Saddle Horse Society of S.A. and the Rhodesias. Founded in 1943 owing to the scarcity and also the diversity of material, this society is as yet in the formative stages of creating the desired type of South African saddle horse and is applying the recognized methods of inspection and selection of standard-bred foundation breeding stock to achieve its aims.

Private Enterprise.

The promotion and maintainance of any branch of farming enterprise are largely in the hands of those who supply a demand that is worthwhile, and in this connection influential representative and organized public bodies can make a considerable contribution towards the breeding and use of horses.

There are numerous ways and means of maintaining a high standard of quality, efficiency and performance in a country's horse stock. So, for example, the racecourse and all that is associated with it—selective breeding, exhaustive tests for stamina, vigour and breeding ability, approved breeding and maintenance methods, to

mention only a few factors—play no mean part in horse-breeding interests.

Agricultural Shows.

Most often the horse entries at agricultural shows are not only the most numerous but also the most attractive. Unfortunately the educative and promotive value of such entries is seldom fully exploited. Breeders and other interested visitors are denied instructive comparative information on the entries. Lack of time, congestion and overlapping of the judging of different classes prevent the student-breeder from obtaining the much needed information; judges do not give a comparative review of the placings and merits of exhibits; there are no meetings of groups of similar interests and most visitors come away from an event costing much hard work and expense with a jumble of a few showy peeps at a variety of classes and types. Most shows stress the mere display side of entries, overlooking the more important utility aspects. Greater importance should be attached to performance and to production classes. It is more important to grant high awards to the *progeny* of sires or dams than to such individuals; many breeders can buy high-class breeding stock but to *produce* high-class stock merits higher awards. Similarly, teams properly equipped in various outfits should be preferred to mere individuals.

The agricultural show should support the utility aspects of horses, leaving the ring events to riding and polo clubs. Since the horse section is often depended on to serve as a special attraction, every effort must be made to make these "utility" classes as attractive as possible; six or more teams of two or four properly equipped "heavies" or teams of eight lighter horses or mules, together with sire and dam progeny classes, would afford much pleasure and be a great attraction to both the practical farmer and casual visitor.

Horse Improvement Schemes.

Progressive farmers and members of different horse-breeders' societies may institute and organize a horse-improvement scheme of their own, in which only "approved" stallions are used. A selection committee is appointed and acts according to fixed standards. In time to come the areas in which such schemes are undertaken, would become recognized reservoirs or supply centres of good breeding and work stock.

Such movements would ultimately secure wider adoption and grow into a national force which would be in a position to claim State aid in the provision of funds and legislation.

The Production and Registration of Horses.

There are two main systems of horse production, viz. (1) the extensive, or ranching system, where a troop of mares, sometimes numbering up to 300, is run with little or indifferent supervision or attention, and (2) the system where mule breeding forms the major part of the undertaking, the animals being rounded up periodically for branding and the making up of sale lots.

In the latter case stallions and jacks of various degrees of breeding are run with the mares during the breeding season and often all the year round.

The uneconomical and wasteful aspects of this sort of animal breeding are very obvious and of recent years many farmers have

taken steps to bring their equine breeding operations within profitable and respectable limits. We are becoming more horse-minded and more conscious of veld and soil conservation and good land use. We feel that every animal unit must count. We know that a good

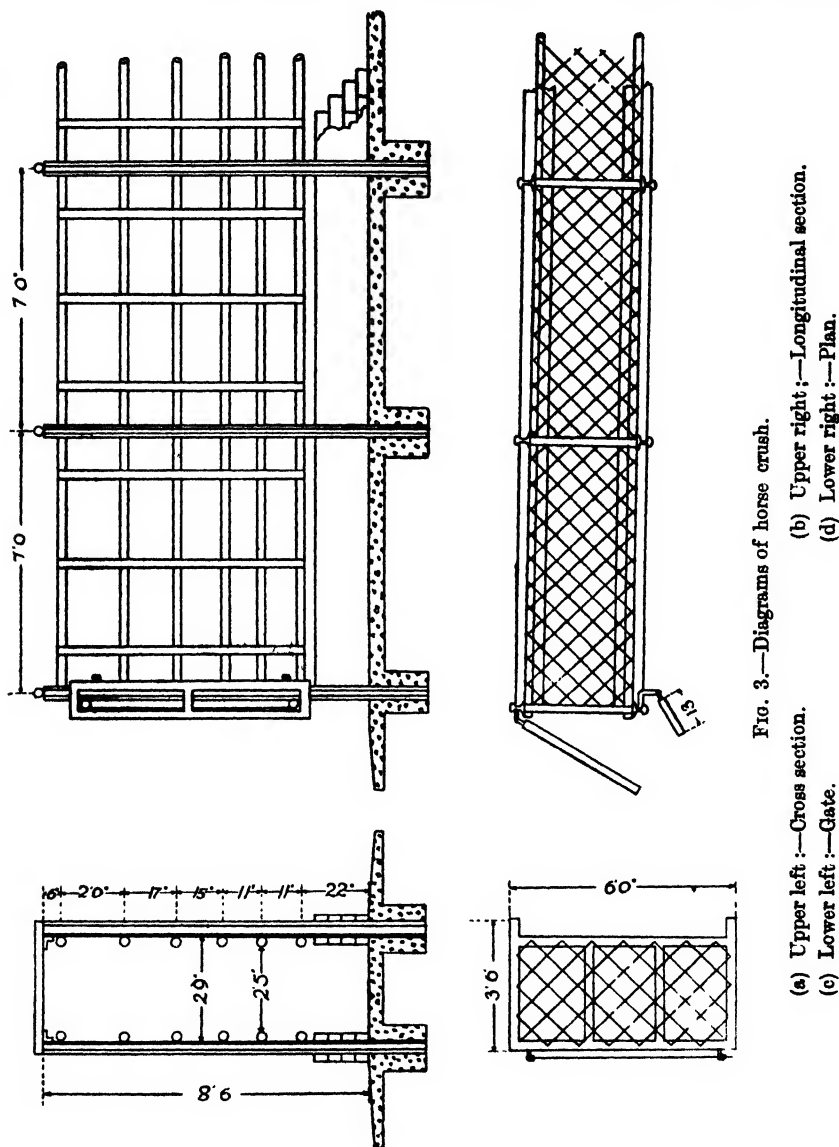


FIG. 3.—Diagrams of horse crush.

- (a) Upper left :—Cross section.
 (b) Upper right :—Longitudinal section.
 (c) Lower left :—Gate.
 (d) Lower right :—Plan.

horse or mule always realizes a good price. So why not breed such animals, instead of numerous unwanted unusable beasts that utilize veld and attention that could profitably be given to better stock.

The horse, like the dairy cow, demands special care and treatment; they are both long-term investments. The badly bred, unproductive horse is a liability and often drives the would-be user of horses to donkey teams or tractors. In some countries bone and meat meal factories find a use for him; but up to the present this has not been the case in South Africa.

Stables, Exercise Yards and Paddocks.

The horse section on a farm or horse farm needs, besides capital, all the planning and operative knowledge required for any other farming enterprise. First essentials are suitability of the area and the farm in particular, good lime soils, good grazing and good supplies of supplementary feeds. Then comes the necessary equipment, stables, stalls, paddocks, grazing camps and also exercise yards for stallions during periods when they are not at work. A paddock for mares due to foal, and another for young stock, a service paddock, a service stanchion and a horse crush are further indispensable adjuncts. (See accompanying diagrams). The roping of 50 or more young animals for branding, inoculation, etc., sometimes results not only in broken backs but also in broken necks.

There are many different plans for buildings, yards, and paddocks for all sorts and types of farms and climatic conditions, and for different classes of horses. In the erection of buildings, paddocks, yards, drinking troughs and service yard, the breeder must carefully consider various factors. In the first place the general lay-out of the main farm buildings must be taken into account; frequently economy of time, labour, personnel and ease of supervision is overlooked.

Stables.—In South Africa all doors should face north. The top door must be slatted or barred (most stable doors are of the barn type although sliding doors are to be preferred), and windows 6 feet up are also barred so as to let in as much sunlight as possible. The south, east or west windows must be high up and capable of being shut properly. In large communal stables ventilators are installed in the roof. Small yards leading off each stall or box are very desirable but not always possible; therefore, additional and safe exercise yards are indispensable. Stallion stalls or boxes should be away from those of mares or face away from them.

Sanitation, ventilation, freedom from rats and vermin, and fire prevention must receive due consideration in the lay-out, as well as the choice and type of building material. The best kind of floor for stables is still a matter of controversy and choice. There are many objections against concrete or brick floors, and possibly as many against hard earthen floors. Where ample paddocking can be provided, concrete or brick floors well bedded will, of course, be more permanent and also more hygienic. The surface should be roughish and slope away slightly from the manger for proper drainage. The stable should be of satisfactory size and have a ceiling about 10 to 12 feet high. In a very large building ventilators are installed in a peaked roof, and no ceiling is necessary.

The stallion's box should be provided with a good steel manger and a hay rack at the same level. Overhead slatted hay racks should be avoided; rather feed the hay in one corner on the floor.

Exercise yard.—A safe exercise yard is a very necessary item on a horse farm. If facilities do not exist to have a stallion ridden or walked or worked, he can be placed in a safe yard. A yard 50 yards by 50 yards, or even 100 yards by 25 yards, will furnish ample space for exercise. In this yard the stallion can be run at the end of a 17-foot lounging rope with the groom arranging the trotting in a

wide circle. Such a yard is enclosed with wooden rails supported by strong posts every 10 or 15 feet. Three rails are often deemed sufficient. The bottom rail is 3 feet from the ground and the others are $1\frac{1}{2}$ foot apart, giving a fence 6 feet high. All connections must be smooth to prevent scratches or other injury.



FIG. 4. Young registered Percherons showing good care and management.

Paddocks.—A series of paddocks providing good grazing, and made self-contained and comfortable by providing shade and water, is a very necessary adjunct to the successful management and rearing of different classes of horses, especially young stock and brood mares.

It is imperative that different classes of horses be kept apart. Dry and foaling mares should not be run together. Mares with foals at foot, filly and colt lots, work horses, dry mares—all require separate paddocks.

Colts are separated from fillies when they reach the age of twelve months as they then become too playful and should begin their training, if this has not started at birth.

Paddocks should not be overstocked, particularly those used for foaling mares, mares with foal at foot, or filly and colt lots. They should be rested and refreshed. Established pastures will be a great acquisition on the horse farm, especially for mares with foals at foot, weaners or yearlings. A few hours' grazing each day where such paddocks are limited, will be most beneficial.

The horse breeder must appreciate very fully, and be convinced of, the superior value of good grazing for the successful development of good horses.

Founding a Stud.

It is a fundamental fact that any enterprising man can start in a small way according to his pocket and the limits of his facilities and build up a stud by known and approved principles to a status of profit and high standard. Select the best mares from a troop or purchase discriminately a stud of brood mares or fillies to the number that can be maintained with approval. Secure a registered stallion or make use of the Government scheme for farmers or of a private stud scheme. Breed and produce what the market demands. The market for good horses is always good.

Mule Breeding.

As the maintenance and development of different classes of stud horses are discussed in another chapter, only a few helpful suggestions for the larger stud mainly engaged in mule breeding are offered here.

To run the whole troop in one lot is simply courting disaster. Mares due to foal should be separated from other classes of horses and other livestock, especially mules. Attempts must be made to overwinter such mares on reserved pastures till weaning time when they are moved without weanlings to a reserved camp or paddock for the next foaling season. Before the mares are moved to this camp or paddock, it must be combed for any obstruction that may cause accidents to newborn foals; anthear holes and sloots or dongas, for example, must be filled in and drinking troughs or dams made safe.

Every effort must be made to get mares into good foaling condition. If grazing in the reserved camp is insufficient, supplementary feeding must be supplied. Any of the recognized hays, with the addition of a good legume hay, will go a long way towards achieving better results. Under overstocked conditions, and also with a mob of inferior stock, supplementary feeding is costly—but why waste good land on such a proposition?

The weanlings should be maintained on good veld, but during winter supplementary feeding is indispensable in order to promote continued growth. A bone meal and/or calcium carbonate or phosphate lick is very necessary. The lack of quality and size in our horse stock is directly due to the stunting of weanlings during the first winter. An inexpensive shed with hay racks leading off a large kraal well bedded with clean grass hay or straw where the weaners can be fed some nutritious hay during the night, contributes greatly to success. This treatment of foals tends to tame them and reduces the cruelty of crush and lasso at training age.

A stud of registered horses should only be conducted by a master breeder and horse lover who has first operated with success on general lines, before undertaking an advanced breeding proposition. He should know all the elementary and advanced facts and practices of horsemastership, and have an intimate knowledge of the breed characteristics of his own and other breeds of horses, of pedigrees, blood lines, records of performances and market demands.

He will cut his coat according to his cloth and maintain only that number which he can develop with profit—without stunting of valuable well-bred colts.

Mares due to foal are moved to individual foaling paddocks three to four weeks before foaling. When newborn foals are ten to fourteen

THE HORSE ON THE FARM.

days old, they can join other mares with foals at foot without any risk of being fatally kicked. The good horseman starts his training right here. Foals are extraordinarily prone to show cupboard love. A lump of sugar, salt or raisins will soon make them pets. They come at a call and can be handled and petted; feet are lifted, limbs



FIG. 5.—Histon Dictator, now at the Central Stud, Grootfontein College of Agriculture. A well developed 2-year-old colt.

are rubbed, and the battle of training them is more than won. In this way the cruelty attached to the use of crush and lasso (vang-riem) or farrier straps and hobbles can practically be eliminated.

The treatment during weanling and yearling stages must be such that development is continuous. Our climate is very temperate compared with that of other horse-raising countries and we can reduce stabling to a minimum, provided feed supplies are ample and nutritious. To coddle colts is often harmful, but so is unnecessary "hardening" by leaving them on depleted pastures during frosty nights in biting wind and inclement weather.

Registration.

As indicated elsewhere, there are horse-breeders' societies affiliated to the South African Studbook Association, while registered horses of other breeds are registered with the S.A.S.B.A.

The stud breeder will, of course, become a live member of his society and become *au fait* with all the rules and regulations of his society. We use the words "live member" intentionally because endless trouble and expense often result from the negligence of some breeders in not observing correct registration procedure.

Stud Books or Herd Registers.

Any kind of business requires at least a simple and effective system of recording and bookkeeping. The horse breeder must know the ancestry of his animals as well as their performances in the production of work and reproduction. He must know when valuable mares are due to foal so that proper arrangements can be made for safe and satisfactory results. He must know whether his horses are mere boarders or a paying branch of his farming enterprise.

Properly arranged stud books exist and should be in the hands of every horse breeder. All the necessary data can be recorded here, supported by a "day" book or notebook in which timely and seasonal records are entered.

A herd register or stud book must contain the name, age, registration number, a full description, identification marks, a pedigree of at least three generations, weight and height and other important measurements. (Measurements of cannon, knee and hock, heart girth, forearm, gaskin, width of chest, etc., may also be recorded here.) Each animal has its own page giving its full pedigree and history, and photographs may also be pasted in. These will greatly enhance the value of such a record for those who follow on.

Identification Systems.

Branding.—It is most necessary that an animal should be readily identifiable, i.e. in respect of individual and ownership. There are various identification systems, the most common being branding. Branding is repugnant to many horse breeders, but if the system is good and the branding carefully done, very little disfigurement results. The marks may, for example, be A. 101—A for Adamson (ownership) and 101 for identification of the particular animal whose history is recorded in the private stud register.

A brand for individual identification generally consists of numerals used consecutively, while a single letter is often enough for identification of ownership.

A three-inch high brand with 1/16 inch cut on the neck, croup, thigh or shoulder is readily seen at a reasonable distance. The iron must not be red hot and, if the coat of hair is short or shorn, need not be applied for longer than a second.

Tattooing.—In a small stud of valuable animals tattooing on the gum is favoured. Tattooing sets are obtainable and if the instructions are carefully followed, a good and permanent mark may be left.

Ear notches are seldom, if ever, applied to horses, nor are **ear tags**. None of these systems is infallible, as the marks may be mutilated or destroyed. Therefore, a careful description giving any particular mark, colouring or blemish is very valuable.

Know Your Farm Business.

O. E. Burger, Professional Officer, Division of Economics and Markets.

THE economic world of to-day respects one type of person only, namely *the man who knows his business*. Consequently, the chances of the person, who has neither the inclination nor the energy to become the absolute master of his profession or business, to attain success in a productive or business community are very slender; gradually but surely and mercilessly he is pushed out and left behind.

This truth is particularly applicable to the farming community. Modern farming is a business undertaking and it is only the progressive farmer, who continually has improvement and increased knowledge in mind, that really is successful.

Unfortunately, however, a serious misunderstanding persists, even among otherwise well-informed farmers, in regard to the scope of the knowledge required by the farmer who desires to understand his farm business thoroughly. Of primary importance is a knowledge of farming matters in general, to entitle a person to be called by the name *farmer* or *agricultural producer*. This knowledge, no matter how thorough or wide in its scope, represents, however, nothing more than a general qualification; *the real test is embodied in the requirement that the farmer should be thoroughly acquainted with, and informed in regard to, the particulars of his own farm*. The discussion hereunder is more specifically directed towards this aspect of the farmer and his business.

Keeping a Farm Record.

It is not an easy task constantly to keep in touch with, and to be fully informed about, all the details of one's business. It is practically impossible for the farmer *to remember* in detail, for example, all the transactions which might influence his business policy. Besides this, however, there are innumerable facts and considerations, such as stock increases and losses, varying numbers, quantities, values and funds, crops and crop failures, labour, draught animals, machinery, etc., which should be borne in mind in one way or another and which must necessarily be used with a fair amount of accuracy in connection with the future planning of the farm business.

No farmer can possibly know his farm business thoroughly if he has to depend entirely on his memory. Even if he dislikes the idea of bookkeeping, he should at least keep record of certain physical aspects of, and important transactions and occurrences on, his farm. Depending on the completeness or reliability of such a record, this is actually what the term *bookkeeping* should in the first instance convey to the farmer. Far too many of our farmers continue to harbour a grudge against the word bookkeeping without stopping to think what it actually means in practice.

No matter from what angle we regard this question, one point stands out clearly, namely that, without bookkeeping in some form or other, the manager of a farm (or any other business) can hardly get a correct perspective of his undertaking. In any case, an honest attempt at bookkeeping at least has the advantage that the farmer will pay more attention to the details of his farm business. If certain records are correctly kept and interpreted, they will eventually lead to a better understanding of farming as a whole and,

consequently, to continual improvements, greater efficiency and higher profits. More and more farmers are continually becoming convinced that they can increase their income through adopting a system of bookkeeping.

A further consideration is that of indication or measurement. What, for example, is the use of a watch without hands? Or, to put the question differently: What misfortune threatens a ship without compass and steering adrift on the ocean? *This is exactly the position in regard to farming when the farmer does not plan ahead, with definite facts and figures at his disposal.* The captain (in the body of the farmer) may be on his ship, but he is absolutely powerless without the equipment required for the determination of direction.

Furthermore, the old argument that the farmer is always busy out-of-doors and has no time for figures, is stale and out of date. One realizes, however, that the capable and diligent farmer is a busy man and that additional duties, such as bookkeeping, for example, should not take up too much of his time.

The New Method of Farm Bookkeeping and Calculations.

Knowing that the hard-working farmer is always pressed for time, the Division of Economics and Markets has for some time been engaged in enlightening farmers on a system of bookkeeping which will give them the best results with a minimum of labour and sacrifice. In 1940 the Division summarized these ideas in an "Account Book for Farmers".

Let us state immediately that it is not necessary for the farmer to be trained in bookkeeping if he desires to adopt this simplified and practical system of accounting, specially devised for farmers in South Africa.

We know that many farmers in the Union already fully realize the value of figures, bookkeeping, etc.; what these progressive farmers had been waiting for all the time, was an effective and practical account book.

Consequently a careful study was made of the position during 1938, with a view to compiling an account book which would, once and for all, meet the numerous requirements of farmers in this respect. The result of this study was the publication, in 1940, of the "Account Book for Farmers" referred to above. Since, in compiling this book, the Division sought and obtained valuable advice from farmers themselves, it may rightly be said that farmers made a direct contribution towards the development of their own bookkeeping system.

However, as we all know, the farming community is made up of numerous classes of farmers; consequently their requirements, as far as bookkeeping is concerned, are extremely divergent. The first problem with which the compilers of the book were faced was, therefore, how to satisfy all farmers.

We feel that we can safely contend that the attempt at satisfying the bookkeeping requirements of all classes of farmers was indeed a success, but this could be accomplished only by devising a very comprehensive system. *Let it therefore be emphasized immediately that it is unnecessary for any farmer to complete all the available forms; each one need merely use those forms which provide for his own particular requirements.* And since the book is based on the "loose leaf" system, the unnecessary forms may, for the sake of convenience, be removed.

KNOW YOUR FARM BUSINESS.

Self-training in Bookkeeping.

But no progressive person will remain satisfied with any rigid, incomplete system for long; satisfaction comes only from the knowledge that there is scope for development and progress. One of the main objects of this bookkeeping system is, therefore, *self-education in bookkeeping*. Consequently, a brief, simple and concise explanation was needed, in the first instance, for the account or work books (Part I of the set). All that the farmer has to do, if he knows nothing about bookkeeping, is to start with the simplest records, as indicated in the Explanations, and systematically to use more forms from year to year—that is, as his bookkeeping requirements may dictate. It was mainly to render this possible that the “loose leaf” system was adopted.

The main objects of this new and simplified system of bookkeeping may then briefly be set out as follows:—

(1) The introduction of a system of bookkeeping which will be of use to every class of farmer in our country.

(2) To provide systematic self-education in bookkeeping for those farmers who did not have the opportunity of receiving instruction in the subject at school or at college.

(3) The final elimination of what is, for the farmer, a cumbersome, misleading and out-of-date commercial system of bookkeeping.

As we have already briefly explained the first two objects, we may now consider the third point, which is perhaps the most important.

A Purely Farm Bookkeeping System. -

The writer is convinced that the older generation of farmers had such a dislike for bookkeeping chiefly because private interests offered them a system of bookkeeping which was in no way adapted to farming.

When we refer to farming as a business, we do not have in mind a commercial business. As every farmer realizes only too well, farming is an *organization* whose general character is that of an enterprise between a factory (sometimes even a mine) and a commercial business. For each of these undertakings an indispensable system of accounting had to be evolved to suit its particular demands. But if either of these bookkeeping systems were to be applied, unchanged, to agriculture (with its special character and peculiarities), the result would be confusing and misleading and a waste of the farmer's precious time.

A commercial bookkeeping system, for example, makes provision for a “Ledger” in which everything of importance to the business is recorded under separate headings or accounts. This requires a great deal of writing and book-work, but it is essential for the merchant; for the farmer, however, who only wishes to know what the total income and expenditure of his farming *as a whole* amounted to over a year, it is simply a waste of time. Moreover, the result is often misleading, because, in following the commercial practice, only cash items are entered on the accounts, whilst non-cash items (such as labour, cost of animal and mechanical power, etc.) are not included. In fact, the ordinary commercial system makes no provision for such cost items.

In view therefore of its special character, diversified farming particularly should, in the first instance, be regarded and treated as something indivisible. In other words, the result of the year's farming must be calculated for the *farm business as a whole*. The farmer who is not interested in an analysis of the various branches of his farming, or in costing, should not be burdened with a long series of separate accounts.

On the other hand, the farmer who wishes to undertake enterprise analysis must avoid the ledger systems; what he requires is proper cost records. Such a farmer should also realize from the outset that he requires professional and/or clerical assistance if he wishes to avoid disaster in such an ambitious attempt. He must remember that a careful and effective analysis of the various branches of his enterprise may result in great financial gain; consequently he will be able to afford the services of a part-time or full-time bookkeeper. On the other hand, faulty analysis of the branches of a business, by the farmer himself, may result in serious financial loss.

Adaptability to Modern Requirements.

There are already many enlightened and progressive farmers in our farming community; but what of those unfortunate individuals who have not yet awakened to the drastic changes which the course of time has brought about?

Let us remind these people of the fact that the modern farmer has an *annual income* which exceeds the total *capital investment* of the farmer of 50 years ago*. He borrows more money than the farmer of those days; he risks more money and credit; his costs are higher; he has a wider choice of products to produce—with a corresponding variety in the implements and equipment to be used; diseases and pests are far more prevalent; soil fertility is lower; new markets, locally and overseas, are available; ways and means of transport and retail marketing at his disposal are numerous; and many more drastic changes of a similar nature, which may please or displease him. Whatever his reaction might be, he should bear in mind that the chances ~~to~~-day of making wrong decisions (which will undoubtedly lead to losses and retrogression) are much greater than 50 years ago. *In these circumstances it has become imperative for the farmer to make use of better business methods.*

The history of man and beast throughout the ages has taught us at least one lesson, namely that of *adaptation*. Without adaptation to changing conditions, progress is ruled out; even worse, deterioration and annihilation of the individual and his group are predetermined by the inexorable laws of Nature.

In regard to the farmer, adaptation to changing conditions means, in the first instance, reorganization of his farming, if necessary. Many farmers realize that certain alterations in the composition of their various enterprises or branches of farming have become absolutely necessary. However, for the majority of these farmers it is impossible to determine correctly the nature or extent of the desired alterations, because they have no particulars at their disposal in order to construct a basis for their decisions. But, unless the facts are known *it is impossible to recommend with certainty alterations or improvements in the system of farming practised in some definite area or on a particular farm.* The only answer to this is that a practical system of bookkeeping be applied. The latter will then serve as a basis for analysis and conclusions and for summarizing, at the end of each statistical year, the financial position of the farmer and his farm business.

Annual Summary of Results.

We are, however, now confronted with another difficult problem which had to be solved at the time when the "Account Book for Farmers" was compiled, namely the question of *summarizing*,

* "Farming is a Business", *Farming in South Africa*, January 1946.

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which is also closely bound up with the idea of self-education in this line of knowledge.

Unless a farmer prefers making entries or calculations of certain subsidiary aspects only of his farm business, he will regard his bookkeeping as futile if, at the end of the year, he cannot summarize the details which have carefully been entered on the various records. This is, indeed, the only manner in which he can calculate the financial result of the year's business. It was also in this respect especially that the old commercial system of bookkeeping was so clumsy and unintelligible for the farmer—and thus directly responsible for many frustrated efforts at bookkeeping.

In the explanatory pamphlet (Part I of the set), the following three methods of summarizing are recommended and explained—each one adapted to the particulars which any farmer may wish to record:—

(1) A method for the majority of farmers who are interested only in *total* income and expenditure figures. In other words, this method was specially devised for the farmer who considers his farm business in the light of an indivisible unit. It should be pointed out that this is also the obvious method for purposes of income tax returns.

(2) A method for the comparatively large number of farmers who take a particular interest in the capital investment in their farms and who may, therefore, spend considerable time on an inventory. The financial result of the year's farming may, however, also be calculated in this manner; moreover, the farmer would have at his disposal a simplified and valuable balance sheet at the end of the year.

(3) A method for those few who are not only *interested* in the analysis of the various branches of their farming, but who are also in a position (technically and financially) to undertake such an analysis. Also in this case, however, provision is made for the calculation of the final result of the farm business as a whole.

Does Bookkeeping Pay?

We have repeatedly emphasized that bookkeeping, in some form or other, is indispensable to the farmer who wishes to know his farm business and who really desires to master the facts which largely determine the nature and circumstances, generally, of his undertaking. In case, however, there are still some farmers who are not yet convinced, let us take a closer view of the matter and consider whether bookkeeping is really worth-while or remunerative. In other words, let us try to answer the following question: To what extent is a farmer rewarded, through actual results, when he applies a bookkeeping system such as is contained in the "Account Book for Farmers"—no matter whether it is applied in its entirety or only in part?

In the first place, it must be pointed out that most of our farmers to-day keep a so-called pocket-book, since the farmer has learnt from experience that he cannot rely on his memory alone. In this little pocket-book he makes notes in regard to all the most important happenings or events on the farm and sometimes even of business transactions.

This is actually the beginning of all farm bookkeeping.

Investigation will show, however, that the pocket-books of most farmers contain insufficient information, since these books are small and very few details can be jotted down in them. Like other

half-truths, these incomplete notes on events and/or transactions may, therefore, definitely be misleading.

Having regard to this serious imperfection of the ordinary pocket-book, provision is made in the "Account Book for Farmers" for a *Diary* (or *Daybook*), which is merely a pocket-book in a large or more complete size. Although the farmer cannot carry the large leaves of the Diary with him, he can always keep them on his desk, or in any other convenient place where he can make rough notes at any time during the day. Columns are provided for convenience so that any receipts or payments made during the day can be entered.

Substituting a complete diary for an incomplete pocket-book is certainly a big forward step for the beginner in bookkeeping. By making this change, he has turned a poor and half-hearted effort into a solid foundation for his system of accounting, on which he can build with confidence.

Of course, the beginner cannot expect his bookkeeping to enable him to start immediately with the calculation of the financial result of his activities during the year. His first reward is that, by making certain notes, he gains a better knowledge of his business and ensures that certain important matters, facts or figures do not slip his memory, even after many years. For the first year at least, the beginner will, therefore, have to concentrate on his Diary and its different branches, viz. the *Record of Products Produced on the Farm*, the *Livestock Register* and the *Labour Register*. These three records may be called specialized diaries, the first being of interest mainly to the grain and/or fruit farmer, and the second to the stock farmer. The third, of course, is concerned with labour generally.

The *analysis* of the financial transactions comes only with the next stage of development. If his general Diary has been kept according to instructions, the beginner will find all these transactions recorded there.

In the interest of the man who maintains that he is not in a position to devote time every day to bookkeeping, attention should be drawn to an important point in the technique of the proposed accounting system. This is that *daily* entries need only be made in the *Diary*. These rough notes can be jotted down quickly at any time during the day when the farmer enters the house. In this way the farmer will ensure that nothing of importance is forgotten or left out of his calculations at a later stage. The further handling of this material may then be postponed until some opportune time as, for example, a Saturday evening, a rainy day, or any other similar occasion.

In the next step he may choose between two alternative methods of developing his bookkeeping system further. Using his general Diary as basis, he may either put the *Cash Book* and *Credit Books* into operation, or proceed directly to the posting of the data contained in the Diary to the records of *Total Farm Receipts and Expenses*. The latter method is, of course, a short cut which eliminates a great deal of work, but is neither as effective nor as satisfactory as the first, since, where this method is applied, the bookkeeping system as a whole is incomplete.

With the data obtained in this way, together with a preliminary estimate of the capital increase or decrease during the year, the farmer can, already at this early stage, calculate the profit or loss

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of the farm business as a whole at the end of the year. From this summary he will also be able to obtain all the details required for purposes of income tax returns. Moreover, the farmer now has at his disposal information about every penny owed by, and owing to, him; and about all the cash income and expenditure in connection with his business on any day of the month or year.

An Inventory.

The next step, that is for the man who desires to build up or develop a more complete system of accounting, will be the compiling of a property list, or the so-called taking of an *Inventory*. In the same way as the diary forms the basis of the running or working branch of the enterprise, the inventory constitutes the foundation on which the entire farm business rests—that is, from the point of view of capital investment. Why then the Inventory is not brought into operation at the very beginning, is a question which might well be asked. The answer is simply that the taking of a correct and reliable inventory is by no means an easy task for the beginner and he may be discouraged if he is confronted with this task at the outset. Although the inventory is taken only once a year, the valuation of the various capital items demands considerable experience and involves some mental strain.

In any case, taking a reliable inventory is very definitely a worthwhile effort, which will certainly bring its reward. It may even be said that, for the work it requires, the inventory contains more information, as a separate record, than any other record in the bookkeeping system. At this stage the farmer is not only in a position to make a very accurate calculation of his farm income and expenditure for the year, but he also has at his disposal a simplified and valuable balance sheet at the end of the year. With this in view, it will be advisable to put the "*Record of Farm Products Consumed in the House*" into operation. In this the housewife, or whoever is responsible for the housekeeping, will undoubtedly be of assistance.

Professional Assistance with Enterprise Analysis.

This, then, is as much as the majority of our farmers will achieve with their bookkeeping, since, in the next step, they will be confronted with so-called enterprise analysis, which is based on the same principles as cost accounting, and which is consequently highly exacting as far as book-work and calculations are concerned.

It has been pointed out above that enterprise analysis will require the part-time or full-time services of a bookkeeper or clerk. The main object with bookkeeping at this stage is not only to establish the relative profitability of the various branches of the farm business, but also to determine which of these branches or enterprises are actually unprofitable. The latter should then be eliminated or replaced—without, however, upsetting the balance of the farm organization.

It may seem unnecessary to point out how the farmer, in this instance, is actually rewarded in hard cash for his bookkeeping [that is, if he can detect the unprofitable, and therefore retarding, branch(es) in his organization], but then it goes without saying that his figures and analysis must be absolutely correct. With full confidence in the latter, he would also have the courage of his convictions and not hesitate to act on his findings, and thus re-organize, where necessary, or eliminate retarding and uneconomic factors.

As has been explained before, however, this reward does not

drop from the skies. It demands both sacrifice of time and concentration on figures. In the first place it requires knowledge of double-entry bookkeeping. Furthermore, use must be made of the complete *Labour Record* and all the other cost records, namely the records of *Draught Animal Costs*, *Machine Costs*, *Implement Costs* as well as the *Feedstuffs and Grazing Records*.

By means of double-entry bookkeeping, cash entries can be transferred from Cash and Credit Books and classified in the *Analysis Record of Total Farm Receipts and Expenses*. These totals are subsequently posted to the *Summarizing Statement*, together with the figures from the various cost distribution records. Only then is the process concluded in the *Final Summary Statement*.

Most probably, while reading through the last few pages, you have arrived at the unpleasant conclusion that you are no less than a stranger to your own enterprise and that actually you know very little about its statistical, economical or business aspects.

If this is the case, then you have made an important discovery to-day. As a matter of fact, by admitting it to yourself, you have already decided that you should have a better knowledge of your own farm business. All that remains is to act in accordance with your decision. This means that you will place an order immediately with the Government Printer, Bosman Street, Pretoria, for a set of the "Account Book for Farmers" (price 12s. 6d. per set, post-free).

As indicated previously, Part I of the set consists of a pamphlet, which explains the whole system and working of the various records. Should you, however, at any time experience difficulty with book-keeping in general, or with the account book in particular, do not hesitate to consult the Division of Economics and Markets, Union Buildings, Pretoria. The sooner the farmers of South Africa become "figure conscious", the sooner our agricultural industry will be based and operated on business principles. Only then will the farmer be able to claim that he knows his business.

Sale of Karakul Sheep.

38 Karakul and 60 Karakul-Persian Crossbred Sheep will be sold by public auction at the Groottfontein College of Agriculture, Middelburg, Cape Province, on Tuesday, 22nd July 1947, at 10 a.m.

19 Karakul rams.

19 Karakul ewes.

60 Karakul-Persian Crossbred ewes.

All financial and trucking arrangements must be made with the auctioneers, Messrs. Kock and Kruger, Middelburg, Cape.

The Mango in South Africa.

Part II.—Propagation and Cultural Practices.*

Dr. Raimund H. Marloth, Officer in Charge, Sub-tropical Horticultural Research Station, Nelspruit.

JUDGING by the numerous publications available on the propagation of the mango, and considering its small relative importance in horticultural practices of the world, more than ordinary difficulty seems to have been experienced in this connection. This has been confirmed during three years of trials with vegetative propagation of the mango carried out at the Nelspruit Research Station.

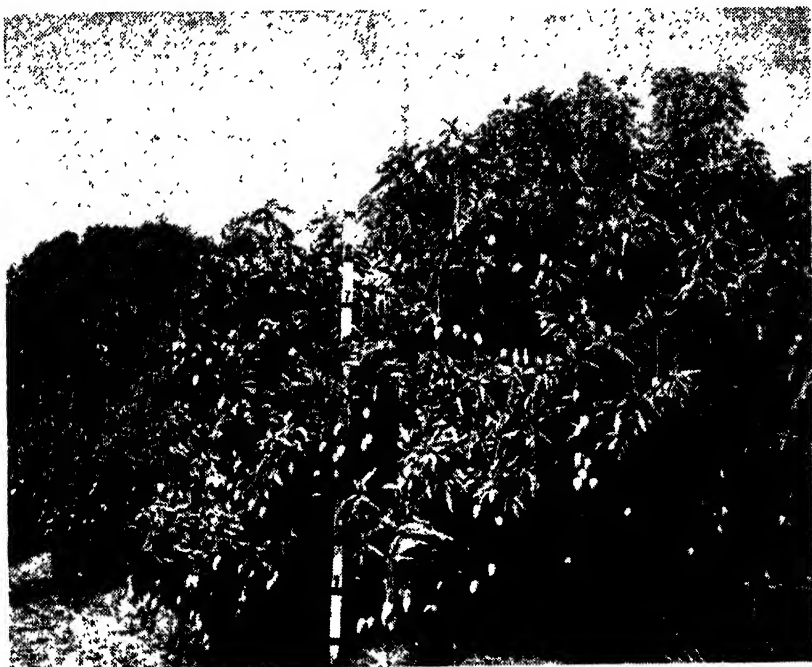


FIG. 1.—Fourteen-year-old Aman Dusailri approach-grafted tree bearing an excellent crop on poor soil.

Seedlings.

Certain types of mangoes exhibit polyembryony, which means that the seed is composed of apogamic or vegetative embryos in addition to the true embryo which can be fertilized. A single seed from fruit of one of these types will produce from one to five seedlings (one seed gave rise to eight seedlings), each one of which when separated could grow into a normal tree; it seems that the true embryo in this group is either often absent or fails to germinate. Trees raised from the growth of apogamic embryos are identical with the parent, being a vegetative offshoot thereof. Trees resulting from the germination of a fertilized embryo would have characters inherited from the mixed genetic make-up of both parents; such trees seldom produce fruit equal to that of the parents, and when in

Part III of this article will deal with the production and marketing of mangoes.

rare instances they do produce superior fruit, it would be worthwhile to propagate from them vegetatively to form new varieties. Other mango types are monoembryonic, the seed having only one embryo which, when fertilized, gives rise to the type of tree just mentioned.

Most of the improved named Indian mango varieties are monoembryonic, and thus cannot be propagated from seed if they are to retain their true varietal characters. In the East Indies, the Philippines and South Africa the present best varieties are polyembryonic, and practically all propagation is by means of seedlings. The Sabre and Peach only seldom produce a seedling which is not true to type, but the Kidney produces a high proportion of such trees, and consequently has degenerated and lost its importance as a commercial variety.

Rootstocks.

Since seedlings from polyembryonic varieties have such a high degree of uniformity, it follows that such are best for stocks for approach-grafting, in-arching or budding. Rootstock experiments with the mango have been under way for many years in Java, India, Ceylon and more recently at the Nelspruit Station. No recommendations can as yet be made for the Union. It is known that varieties differ greatly in their budding compatibility with the same stock, but for all practical purposes for many years to come seeds of either the Peach or Sabre varieties will be suitable. The tendency of the Kidney to produce numerous varieties makes it unsuitable for stock purposes. The most desirable stock would seem to be one which grows vigorously, is uniform and has many fibrous roots. The latter will ensure better success at transplanting when the taproot-system is reduced. The Pullima sour mango of Ceylon seems to be of this type.

Approach-grafting.

For centuries in India approach-grafting has been the accepted method of vegetative propagation of the best mango varieties which do not come true from seed. This has also been used successfully in the Union, but a less costly and less laborious method for large-scale commercial nursery work is to be preferred. In this method the stock is established as a seedling in soil in a container, brought into juxta-position with a branch of the parent tree it is desired to propagate from, and a union effected between the two by means of a whip-and-tongue approach-graft. The stock and the parent branch should be of about equal diameter, and in cutting the whip the incisions should be such that two-thirds of each of the stock and the parent are severed so as to obtain at least a two-thirds' overlap. The union is tightly wrapped with raffia and the whole coated with a grafting wax.

In from two to three months satisfactory union should have been effected; severing of the lower portion of the parent and the top portion of the stock may now take place. At weekly intervals a notch in each of these is cut deeper in three stages, giving complete severance. The grafted tree should be kept in a lath-house until the union is well healed over, when the tree can be planted out in the orchard.

Budding.

From a practical commercial nurseryman's point of view the most satisfactory method of propagating trees is to plant seedlings in nursery rows, bud them with the desired varieties, lift the resultant budded trees bare-root, and despatch them in packing to the future

grower for direct planting. Unfortunately the mango is not as simple to work with as, for instance, citrus, being even more difficult than the avocado.

Naik (1941) in his extensive studies on the propagation of the mango in Madras Province at the Kodur Fruit Research Station found that in germinating seeds the best seedlings were obtained when seeds still in their husks were planted with the plumule (growing point) up, the top being about one inch below soil level. When weevil infestation is bad, it would be advisable to remove the kernels from the husks in order to eliminate badly eaten kernels.



FIG. 2.—Approach-grafting of the mango. (A) Stock (s) established in container. (B) Stock (s) united with parent (p) by means of a whip-and-tongue approach-graft *in situ* at the parent tree. Note stakes driven into ground on which container is fastened by means of wire. (C) Grafted tree some months after severing from parent and ready for planting in orchard. Note first normal fruit already being borne.

This should be done soon after removal of the seeds from the fruits, and the kernels should not be allowed to dry out after their removal from the husks. Deeper trays than those usually used for seed germination in lath-houses are required, and there should be a minimum of nine inches of soil in such trays; for large-scale work open-ground shaded seed-beds should be used. Some two to four months after germination the seedlings can be planted bare-root into nursery rows, being spaced 2 feet apart in the rows and the rows 3 feet apart. Heavy defoliation of the seedlings about a week before lifting will reduce subsequent casualties. Individual shading with branchlets and keeping the soil wet until new growth starts will also assist in obtaining a better strike.

When the stocks are about 3 feet high and about $\frac{5}{8}$ ths to $\frac{7}{8}$ ths inch in diameter at ground level they are ready for budding. At the point of budding the bark must neither be still green nor already

completely brown, but at an intermediate stage. It has been found that one of the two main time factors contributing to successful budding is that the stocks must be at a stage where the new flush has just commenced, and when the young leaves are about 1 inch long.

The correct preparation and selection of the budwood is of the greatest importance. The best buds come from wood of the 2nd or 3rd flush from the ends of branches, the bark not having browned yet, and should be taken only at such times of the year as, or just before, the terminal buds open. Fourteen days before the budwood is required all leaf-blades are cut off from the petioles on the selected budstick while still on the parent tree. An $\frac{1}{4}$ th inch complete bark-girdle is made at the base of the stick. Between the subsequent cutting of the budstick and the actual budding as little delay as possible should occur, as bleeding renders the budwood unfit and a poor take will be obtained with day-old sticks.

A diversity of methods and details of technique in budding and grafting of mangoes is recommended by research workers in various mango-growing countries, but apparently none of these has to date been satisfactory enough to be generally adopted by commercial nurserymen. In Madras, Java and Hawaii side-grafting into vigorously growing stocks is much favoured.

Root-grafting, the modified Forkert shield-bud, and the patch-bud methods all have their champions. Gunaratnam (1946) in Ceylon has adopted the method whereby a shield-bud is placed on the cambium of the stock, which is bared by stripping down a flap of bark, such flap then being tied over the bud; this method is used for the propagation of many thousands of mango budlings yearly, a satisfactory 50 to 60 per cent. take being obtained. Another method of vegetative propagation with which success has now been achieved, is that of air-layering or marcotting, similar to that used with litchis; this success is due to the application of growth-promoting substances such as indole-acetic acid to the ringed portion of the branch before wrapping it with soil and sacking. (Named proprietary products for this purpose are for sale in South Africa).

After years of trials with different methods and techniques with varying materials at different seasons, the following method now used at the Nelspruit Station gives moderate success.

(a) Budwood is prepared as described above.

(b) The times of budding are October-November, February-March, and sometimes June-July just after the seedlings in the nursery have started to flush, provided suitable budwood is available on the parent trees.

(c) With stocks thicker than 1 inch in diameter, patch-budding, carried out according to ordinary technique, is used. Better results were obtained with younger stocks by using a shield-bud.

(d) The bud is not sliced off the budstick, but cut with the point and blade of the knife held at right angles to the budstick. Thus no wood of the budstick is cut off at all.

(e) The bud is removed from the budstick by applying pressure at the side. Bending the budstick away from the bud assists in loosening it.

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(f) Tight tying over of the whole bud with raffia has been found to be preferable to the use of insulation tape, rubber strips, or grafting tape. No grafting wax need be applied over the raffia.

(g) The buds are untied three weeks later, and retied so as to leave the eye exposed.

(h) As on the average only 50 per cent. take may be expected, two buds per stock, placed on opposite sides, are usually inserted. These are put in sufficiently high on the stocks so as to allow for re-budding to be done *below* the first budding, should both buds on one stock be found to be dead when untied.

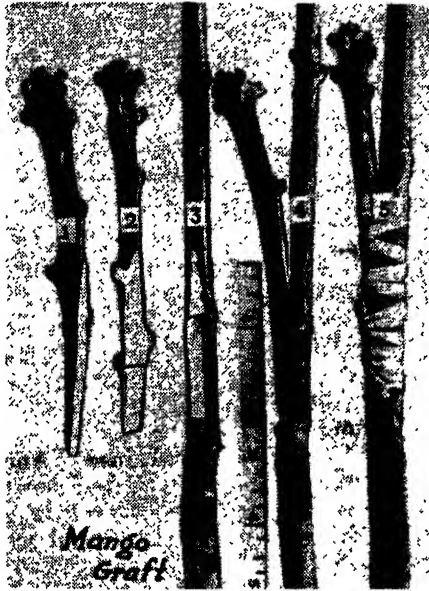


FIG. 3.—Side-grafting of the mango in Hawaii, as illustrated by Pope.

(i) As the bud seldom shoots until the next flush, some months later it might be necessary to re-tie the bud to avoid the raffia cutting into the bark of the growing stock.

(j) At the start of the flush following that in which the budding was done, the stock is cut $\frac{1}{2}$ inch above the top of the former T-cut.

(k) Until such time as the bud begins to grow, and naturally thereafter, all suckers which arise from the stock, should be removed.

(l) Subsequent stubbing, tree-sealing and staking follows normal nursery procedure.

Transplanting.

Probably because of the predominant tap-root formation and the absence of top lateral fibrous roots, the mango presents difficulties in successful transplanting, be it a seedling or budded or in-arched tree. It has been found that if some of the main roots of the young tree are severed in the ground close to the stem some months before lifting, then the laterals and fibrous roots arising from such cuts assist the tree to establish itself more readily when set out in its permanent location. This applies particularly to the tap-root.

Best results are obtained by tinning the tree with a four-gallon tin while still in the nursery row, leaving this for a month or six weeks, and then severing the remaining roots at the bottom of the tin on lifting. This method is costly in labour, material, and transport charges, but it ensures the successful transplanting of a tree which has been relatively costly to produce. An alternate method is to cut the roots of the tree close to the stem with a spade, starting three months before lifting, and making one cut a foot below ground level underneath the tree and two cuts on different sides of the tree at intervals of three weeks each. If the tree is to be moved only a short distance from the nursery to the orchard site it could be lifted bare-root, otherwise tinning or balling must be resorted to.

Before actual lifting, the tree should be heavily defoliated, all tender growth being removed. Shading after planting must be done to protect the now exposed stem from sun-burn and drying out until such time as the growth of the new flush has hardened.

Cultural Practices.

The object of cultural practices is to obtain good healthy growth of trees and the regular annual maturing of a heavy crop of healthy, fine quality fruit. As far as the Union is concerned, not much definite information is available in this respect, but investigations are now under way to determine the most satisfactory economical and practical cultural programme for the commercial production of mangoes. An opinion cannot be given as to what extent alternate bearing and the production of 'small fruit' can be overcome. Allan (1945) gives quite a comprehensive programme, with particular reference to India, which would apply to the modern production of any fruit on a commercial scale, while all research workers in other mango-growing countries also recommend fairly extensive cultural practices. This is in contrast to the hitherto apparently accepted idea of most mango growers in the Union that once the tree is planted, it should be left to fend for itself.

Planting.—Before a new mango orchard is set out, thorough preparation of the land is necessary. On poor dry-land soils trees may be spaced as close as 25 feet apart, but on average soils, especially when irrigation can be practised, trees should not be closer than 35 feet, and 45 feet would not be too far apart under the best growing conditions. The trees bear their fruit on the outside, so that, if they are planted too close together a considerable reduction in the crop due to over-crowding will occur in later years when branches meet. In such a case it will be necessary either to remove alternate trees or to cut-back severely in between the rows.

The Peach grows more rapidly than the Sabre; trees of the former variety should therefore be planted further apart.

Adequately sized holes should be prepared, the larger the better, with a large bucket of kraal manure mixed with the soil at a depth of 2 feet to 3 feet. Trees should be shaded until the first growth flush has hardened, and should be adequately supplied with water even after they are well established.

Fertilizers.—Few experimental results of the fertilizing of mangoes in other countries are available; centuries of practical experience form the basis of present-day practices in India. Scientifically laid out experiments are now under way in several countries,

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including South Africa, but until definite results from these become available it is necessary to rely on accepted practical recommendations based on trials and observations made elsewhere.



FIG. 4.—Peach mango orchard twenty-two years old planted on poor soil under dry-land conditions for first twelve years. Trees spaced too close at 30 ft. apart now that orchard is being irrigated and rate of growth has increased.

Nitrogen has the greatest influence on tree growth and cropping. The best form in which to apply this appears to be the organic. Vegetative growth at the time of the blossom flush in July-August (early spring) is to be discouraged, and nitrogen applications should be made in September-October (spring), so as to encourage vegetative growth flushes following this period, as it is on the shoots of this early summer flush that flowering occurs the following spring. It appears that the use of excess nitrogen on older trees is to be avoided, but on young growing trees liberal applications of kraal manure can be used. In Florida, U.S.A., on very sandy soils four applications per year of a complete inorganic mixture totalling 10 to 40 lb. for large trees are recommended.

All research workers emphasize the need of phosphate and potash for best yields and fruit quality in the fertilizing of mango trees. Popenoe (1929) reports increased yields in Cuba and in Florida resulting from potash applications, but in South African mango-growing areas most soils have abundant available potash so that for the present this may be left out of the fertilizer programme. On the other hand, most soils are deficient in phosphate, and provision must be made for the addition of this. Kraal manure will supply much of the phosphate requirement, but when cover-crops, regarded as a valuable adjunct to the fertilizer programme, are grown, applications of superphosphate should be made prior to the sowing of the cover-crop. Not only will additional growth of the cover-crop be obtained, but the phosphate will become available to the mango tree when this is turned under and disintegrates.

In 1945 the Nelspruit Research Station started a large-scale fertilizer experiment on bearing Peach and Sabre mango trees in

which the effects of inorganic nitrogen, phosphate, and kraal manure in properly replicated treatments are being tested. On account of the alternate bearing tendency of the mango, conclusions will not be drawn until the data obtained from at least five years' yields are statistically analysed. The Sabre trees have borne two average crops of fruit since the fertilizers were applied, and in all treatments the yield per tree was considerably more than that from trees which had not received fertilizer. The 'Peach' trees experienced two 'off' years, and with only very small crops of normal fruit being borne no indications of the effect of fertilizers could thus far be seen. Apparently the fertilizers applied did not influence the relative amount of 'small fruit' set.

Irrigation.—Although the mango tree is fairly drought resistant, its water requirement for good growth and fruiting is relatively high. Dry-land planting should not be made unless the effective rainfall, falling mainly in the summer months, is over 35 inches; there are very few suitable situations in the Union where this occurs. Thus it can be accepted that for commercial mango growing irrigation is necessary. The most critical period for irrigation in the summer-rainfall areas is from just prior to blossom break in June-July to when the summer rains set in. It is essential that mango trees should not be restricted as regards water from full-blossom on until the set fruit has fully sized, for not only will the set of the fruit and its subsequent development be affected, but the all-important early summer flush will not be as great as it might be, when a water shortage is experienced. Mango trees should not be irrigated after the summer rains cease in March, until the June irrigation; blossom-bud differentiation is increased when the trees are induced to rest during this period. Irrigations, when made, should be heavy enough to wet 100 per cent. of the root-area to a depth of at least 4 feet, but, if this is not possible, a partial irrigation will be better than none at all.

In the same orchard in which the Nelspruit Research Station is conducting a fertilizer experiment the general effect of the irrigation of mangoes is being observed. One half of the orchard receives no irrigation at all, and the other half is irrigated three times yearly during the dry season, the fertilizer treatments being replicated in both sections. The only definite influence noted thus far is that the mature fruit from trees which were irrigated were considerably larger than fruit from non-irrigated trees. General conclusions from this experiment cannot be drawn until the differential treatment has been given for at least five seasons.

Cultivation.—For years it has been accepted that the incidence of 'black spot' on the fruit, this term probably including both anthracnose and true black spot symptoms, is far greater in orchards which are cultivated, particularly during the fruit ripening season, than in orchards receiving no, or a minimum of, ploughing or discing. There is no scientific foundation for this, although it is possible that low-hanging fruit would be more heavily infected due to spore-carrying soil being splashed on to these fruits during rains in a clean cultivated orchard. It is recommended that the cultivation programme for a mango orchard be the same as for citrus and other fruit trees. Cover-crops during the summer rainy season not only prevent soil erosion but on being turned under improve the soil. During the rest of the year weeds only compete with the trees for water and plant food and should be disced in before they make much

Efficiency on the Farm.

Dr. John Fisher, Principal, College of Agriculture, Cedara.

AT the present time food production ranks as number one priority in the life of most nations. History will probably show that the past 2 or 3 years were all-time records for world shortages of essential foodstuffs. Our troubles are not yet behind us, and the time thus seems opportune to examine our farming activities to see whether any leaks can be closed or whether we cannot improve our general farming efficiency. The higher monetary wages paid to native labourers have considerably changed their mode of life, and they are entering into competition with Europeans for articles of food which were almost entirely European a few years ago. This fact should not cause undue worry, as, in due course, the change will be accepted by all. What is of serious consequence, however, is that the rise in monetary wages is seldom accompanied by greater efficiency or a larger output of work.

South Africa, like other countries, is experiencing a period of rising monetary wages and could also step up efficiency on the farm so as to face the future with greater assurance.

In most cases the native labourer is entirely unskilled, and remains so even after many years. Consequently, there are only certain jobs on the farm that he is capable of doing, and even these can be done in a right or a wrong way. The writer believes that it would pay handsome dividends if farmers were to spend some time in explaining to their native labourers why certain things are done in a certain way. A number of points will be mentioned to show how a little time and trouble spent in explanations would raise the efficiency of the farm as a whole.

Hoeing.

This is generally regarded as a job for the unskilled labourer because "any fool can use a hoe", but even with a hoe there is a right and a wrong way to wield the implement. It is customary for natives to hoe crops from one side of the row and the hoeing consists largely of pulling the soil away from the line of crops, so that the plants fall over on their own, or are very easily blown over by the wind. In the case of maize, for example, cobs come to rest on the ground, and consequently rot or are gnawed by rodents or are destroyed by birds, etc. In addition, the fallen plants seriously interfere with the passage of cultivators or animals during cultural operations. The correct way is to straddle the row so that the soil is always pulled towards the roots of the plants. If maize is too tall to be straddled, it simply means that the hand-hoeing has been delayed far too long. The time to kill weeds is when they are very small. If possible, they should be destroyed whilst still in the seed-leaf stage.

Harrowing.

It has been observed on many farms that the value of the zig-zag harrow is not fully appreciated. Before new crops are planted, the whole field should be gone over with the zig-zag harrow so that the seed goes into clean ground. This harrowing will destroy thousands upon thousands of young weeds. It may also pay to cross-harrow with the zig-zag. In the case of maize, a further harrowing

can be given before the plants have appeared above ground, provided the plumule is not so near the surface as to be broken off by the harrow teeth. Another general harrowing can be given along the rows when the maize is 4 to 6 inches high. In this way, the entire field is covered and there are no more weeds in the row than between the rows. Then row-cultivation begins. First the arch cultivator is used as near the young maize as possible and then, if the rows are wide apart, cultivators are used between the rows.

If the above procedure is followed, not only is a much cleaner field obtained than where the planting is done without an immediate harrowing preceding the planting, but much less labour is expended in cleaning the field in succeeding years. What often happens, however, is that the first cultivation given is a row cultivation, when the whole field is almost a firm sod of young grass and weeds.

Ploughing.

What a common occurrence it is to see the leading share of a 2-furrow or 3-furrow plough taking only half the cut it ought to take. In the case of a 2-furrow plough, even if everything else is working 100 per cent., the implement can only be doing a 75 per cent. job. On South African farms, most ox-drawn ploughs have no higher efficiency than this. Imagine the extra cost to the farmer which this operation alone must entail for every field which is ploughed every year. If your plough is not fully efficient, ask your college of agriculture how its efficiency can be raised to its maximum. The trouble may have nothing to do with missing bolts, bent beams, lack of oil and grease, etc.

In laying out a field for ploughing, see that the two long sides are parallel, so that there will be no cuts in the middle or at the side of the field, involving many turnings for little work done, and trampling of the soil which has already been ploughed. This time spent in turning for very little work done is expensive. Fields should be 3 to 4 times as long as broad, the long sides being on the contour to economize in ploughing time.

Planting.

Though the preparation of a field may have been more costly up to this stage than it should have been, this is no reason for a 50 per cent. stand of crop. Planting is another operation in which efficiency can be considerably raised. Certain losses in the stand of a crop are, of course, inevitable. The oxen or horses will trample down a few plants, cutworms will get some more, rodents will take their toll, and certain grains will not grow. All these factors cannot be entirely eliminated, but there may also be mechanical inefficiency in the planter. This implement should be overhauled at the end of every planting season. Worn parts must be replaced, and everything cleaned, adjusted, oiled and made ready for the following season. If fertilizer hoppers, for example, are not thoroughly cleaned, the working parts will become rusted together and delays and breakages will result during the ensuing season.

It seems obvious then that the rate of seeding must also be increased to offset the losses due to the various factors mentioned above. Plant the crop more thickly; it is easy to remove surplus plants at the time of hand-weeding when they have done little harm.

EFFICIENCY ON THE FARM.

Since the labour involved in obtaining a 50 per cent. stand is practically the same as for a 100 per cent. stand, more attention to efficiency will double the return without any appreciable increase in the production costs up to this stage:

Varieties.

Another sphere in which efficiency in production can be raised is in the use of better varieties of the crops grown. Should a variety of maize, for example, be unduly subject to leaf scorch (*Helminthosporium*) in some seasons, efficiency would eliminate that particular variety. Greater efficiency in the use of seed would also include the testing of seed for germination, vigour and viability. There should be no delayed germination of seeds because seeds which germinate several days after the main germination produce weak plants which are seldom worth anything.

Alternate Husbandry.

The constant cultivation of the same crop on the same field year after year over a long cycle of years is very inefficient soil husbandry and is the cause of South Africa's greatest national problem, namely, soil erosion. Exhausted arable lands must be seeded or planted to pastures until the virgin crumb structure of the soil is rebuilt under a grass sward.

It is waste of land and time, however, to allow "lands" to revert to grass by themselves. They should be sown where seed is procurable or planted with roots where seed cannot be secured.

Efficient handling of these pastures will prove that they are just as profitable as most arable crops, and in addition have the advantage that they improve the structure of the soil, thereby making the cultivation of other crops possible for many generations to come.

Fertilizer and Pastures.

Efficiency on the farm can also be raised in respect of the amount and kind of fertilizer to be applied and the point of application relative to the seed. The well-informed farmer will know that pasture grasses have most need of nitrogen, whilst grain crops call largely for phosphates. Efficient pasture management therefore includes correct fertilizing with nitrogenous fertilizers, besides rotative grazing. Continuous grazing is ruinous to good pastures. In the past there has been a tendency to look only to the effect of the pasture on livestock, little attention being given to the effect of stock on the pasture.

Efficiency can also be increased in the use of pastures. It is very bad management, for example, to put 2-gallon cows and 4-gallon cows on the same piece of pasturage. If the pasture can meet the grazing requirements of the 4-gallon cow, then each 2-gallon cow is using the pasture to only 50 per cent. of its efficiency. Conversely, if the pasture can only meet the needs of the 2-gallon cow, then the 4-gallon cow must have her efficiency reduced by nearly 50 per cent., and, obviously, poorer producers or non-producers lower the efficiency still further.

It is very important, therefore, that the farmer should balance his livestock's production with the food which he supplies to them.

There are places on the farm for working oxen and places for cows in production, places for young calves and dry cows, places for 2-year-old heifers, places for ewes and lambs and mares and foals, and so on. Efficiency in the handling of all these classes of livestock connotes that they will not all be run together in one pasture field at the same time.

Too often are the cows in a dairy herd all treated alike, whether they be newly calved and in their most intensive production period, or whether they be almost dry. The highest producer is usually penalized the most. Seldom is she managed to promote her highest production. It is obvious, therefore, that more attention should be given to increasing the efficiency of the high-producing animal.

Haystacks.

There is often very considerable waste on the farm because the haystacks are not properly built. Not only is there very great wastage at the bottom of the stack, because the good hay is just dumped on the ground instead of on a prepared stack foundation, but livestock are allowed to burrow into the stack, pull the hay out and trample and foul it with dung and urine. Another mistake made in stacking hay is that the stacker builds the hay around himself, leaving a hole. When he climbs out of the hay this hole cannot be properly filled, with the result that the stack cannot be thatched and rain pours down into the hole, causing the hay to rot down through the stack.

Bags.

Another respect in which there is serious wastage on the farm is in the use of bags. The present scarcity may make farmers more careful about bags, but it is doubtful whether the effect will be lasting. When bags are emptied they should be shaken clean, and carefully piled where rodents cannot gnaw holes in them. Any broken or torn bags should be set aside to be repaired on rainy days, when labour can be profitably employed under cover.

How many farmers wash their fertilizer bags, use the waste water for vegetables, lawns or other purposes and have clean wholesome bags again for farm crops?

The list of places where efficiency on the farm can be increased could be greatly lengthened, but the few instances enumerated above should suffice to show where improvements can be effected. May it be stated in conclusion that an efficient farmer soon inspires his labourers to become more efficient themselves.

A Service Crush for Pigs.

P. L. Kotze, Lecturer in Animal Husbandry and D. L. Greeff, Stockman, College of Agriculture, Glen.

ALTHOUGH in pig-farming the object of proper feeding and management is to maintain vigour and activity in breeding boars, yelts and sows, it nevertheless often happens under the best of conditions that the yelt or sow is unable to bear the weight of the boar. The yelt may be too young or the sow too old or for some reason or another too weak and the boar too heavy or lazy. In such circumstances the breeder needs some device for assisting the mating process, not to perpetuate shortcomings, but rather to obtain, under unfavourable conditions, the maximum advantage from valuable breeding animals.

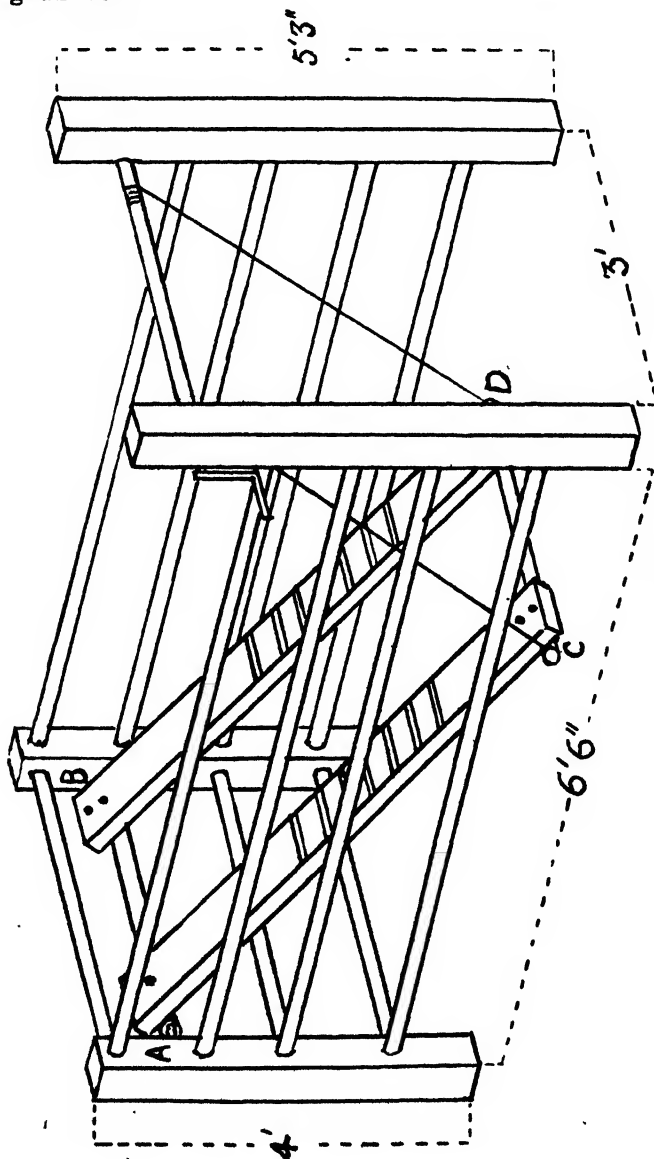


FIG. 1.—Illustration of service crush.

At the Glen College of Agriculture a service crush is being used for this purpose. This crush consists mainly of a frame provided with platforms on the inside of the two sides. The sow stands within this framework and the boar rests its front legs on the platforms. The outside framework measures 6 feet 6 inches in length, 3 feet in breadth and 4 feet in height. At this Institution rails were used for corner posts and 2-inch pipes for the sides but any other suitable material such as wire and 4-inch posts for the corners may be used. For the sake of firmness it will in any case be advisable to embed at least the four corner posts in concrete. The handling of the animals will be facilitated if a funnel-shaped enclosure gives access to the crush.

The platforms consist of two strong parallel boards (AC and BD), each measuring 6 feet in length and approximately 6 inches in width, attached to two iron cross-bars (AB and CD) each about 2 feet 9 inches long. The distance between the two boards varies according to the width of the sow and they should be attached in such a way as to ensure easy shifting. For this purpose hook screws may be used or else a number of holes may be drilled through the iron cross-bars, so that the boards may be fixed at the required distances by bolts.



FIG. 2.—A sectional view of the service crush.

At a height of about 3 feet 3 inches above the ground (i.e. about 9 inches from the top) the iron cross-bar is hooked to the closed side or front of the crush, which makes the platform about 3 feet 6 inches high at AB. The back of the platform must be capable of free up and down movements, which requires the attachment of a few hinges, but hinges are usually not enough. It is more serviceable to use for the iron bar AB a 2-inch pipe which can rotate at the point indicated, e.g. on a thinner pipe which has been pushed through the 2-inch pipe and firmly attached on both sides to the corner posts of the crush. The platform boards must be clamped to such a pipe.

In order to fix the back, CD, of the platform at the desired height according to the size of the sow, three alternative methods may be applied:

A SERVICE CRUSH FOR PIGS.

(a) the iron cross-bar CD may be supported on both sides by chains attached to the nearest corner posts;

(b) the chains may be replaced by thin cable wire running on both sides over pulleys (at least 4 feet 6 inches high) and leading to a hand crank on one side;

(c) the cable wires may be wound by means of an ordinary windlass fixed at the minimum height mentioned. In the latter two cases two short chains may be attached above and below the crank handle on the outside of the corner post for hooking the handle so that the platform may be held at the desired height.



FIG. 3.—The service crush seen from above.

When the sow is brought into the crush, the platform is lifted, and then dropped behind the animal. She then stands in the space between the boards. If she is calm, the boards may be shifted to rest against her flanks; otherwise her width will have to be measured beforehand and the platform adjusted accordingly. The boar supports his forelegs on the boards and thus carries the major portion of his weight himself. Unless precautions are taken, the legs almost invariably slip either backwards or inwards. In order to prevent the former eventuality, flat strips of wood may be nailed cross-wise on to the platform at short intervals, and in the latter case it is important that the boards should touch the flanks of the sow firmly otherwise the boar may entangle a front foot and even seriously injure it.

The sow usually tends to move backwards and consequently the iron cross-bar should be adjusted at such a height as to prevent the sow from stumbling over it or the boar from performing his service. To prevent injury to the animals the bar, if flat, should be adjusted to have the flat side vertical and not horizontal. It is best, however, to use a thin piece of iron with a rectangular or, better still, a circular cross-section.

The above specifications should be suitable for a variety of circumstances and for sows of different sizes. When utilizing the service crush it is most important to have regard to the height of the platform at AB and to ensure that the front feet of the boar will not slip in between the boards and the sow. The length of the platform allows the sow a little moving space to the front in case she is still unwilling. Personal supervision is necessary in case anything should go wrong. A gate at the closed end or front of the service crush may be useful.

The Mango in South Africa:—

[Continued from page 530.]

growth. Ploughing should be avoided in preference to discing on account of possible root damage to the trees and the formation of harmful plough-soles resulting over a period of years.

Smudging.—The 'smudging' or 'smoking' of the trees to induce early flowering has become a recognized practice of mango growing in the Philippines. In Java, certain varieties are very shy bloomers, and here also 'smudging' induces normal blossoming. Smoke fires of green and dried grass, trash, etc., are kept burning day and night for up to three weeks in the orchard and the flowers emerge in from 8 to 24 days from the start of the smoke fires. Fruit on smudged trees ripens several months before that of untreated trees, so that if the treatment is to succeed in South Africa it would have to be commenced approximately in March-April. Tentative trials with smudging were made in the eastern Transvaal several years ago, but no response was obtained. This practice may open the possibility of spreading the season during which ripe mangoes will be available for marketing.

The Inheritance of Size of Ear in Karakul Sheep.

D. J. Louw, Lecturer in Sheep and Wool, Grootfontein College of Agriculture, Middelburg, Cape.

As a rule, purebred karakul sheep have long, large ears, 5 to 6 inches in length and $2\frac{1}{4}$ to 3 inches in width. The ears stand away from the head, giving the animal a very attractive appearance. Some karakul sheep, however, have short ears, from $2\frac{1}{2}$ to 3 inches in length and about $1\frac{1}{2}$ inches in width, ending in a sharp point. Ears of this type tend to hang down and are often referred to as mouse ears. There is, however, a third type of sheep with no external ears except short stubs close to the head. This type is classified as earless. A karakul lamb has even been found with a stub on one side of the head and no sign of any external ear on the other side.



Earless, short-eared and long-eared karakul sheep.

Importance of Ears.

The size of ear is of no economic importance, but the important point is whether or not the animals have ears. The stubs of the earless type are so short and fleshy that it is impossible to affix an ear tag or to earmark them.

In the case of karakul sheep, more than with any other animal, it is absolutely essential to keep a careful record since the fullgrown animal is sold or appraised according to the photo of the sheep as a new-born lamb. For this reason it is essential that every sheep should have an identification mark. If the sheep has no ears, the only alternative is to attach an ear tag to a wire round its neck. There are many disadvantages attached to this method. As the neck grows thicker, the wire must constantly be lengthened to obviate strangling. Moreover, the wire is liable to chafe the animal.

Of the 7 earless lambs dealt with in this investigation, two were born with one ear completely uncovered by any hair or skin. In course of time, however, these wounds healed completely and were covered by the skin. This type of abnormality was found only in the case of earless lambs.

A further disadvantage of earlessness is the fact that earless sheep have a very unattractive appearance.

For the above-mentioned reasons it is therefore undesirable to breed the earless type of karakul sheep. In order to obviate earlessness, however, it is necessary to determine how size of ear is inherited.

According to experiments* carried out in America, it was found that the progeny of long-eared sheep mated with earless sheep, had short ears. If short-eared sheep are mated, the progeny will be long-eared, short-eared and earless. Although only a very small number of sheep was handled, the conclusion was reached that size of ear is determined by a single pair of factors and that the short ear characteristic is the heterozygotic condition which never breeds true.

The following results were obtained from an analysis of a number of karakul lambs born at the Grootfontein College of Agriculture:—

	<i>Long-eared. Short-eared. Earless.</i>		
93 Long × Long	93	0	0
109 Long × Short	54	55	0
26 Short × Short	4	15	7
1 Short × Short	0	1	0

According to the above-mentioned theory, these results may be explained as follows. If *LL* represents long ears and *ll* represents earless, short ears will be represented by *Ll*. The above matings may then be explained as follows:—

Long × Long, or $LL \times LL = LL$.

Long × Short, or $LL \times Ll = 1 LL : 1 Ll$.

Short × Short, or $Ll \times Ll = 1 LL : 2 Ll : 1 ll$.

Short × Earless, or $Ll \times ll = 1 Ll : 1 ll$.

The results therefore correspond absolutely to the theory except that the proportion of the progeny of the short × short mating shows a small deviation. Statistically this deviation is also significant ($P < 0.50$). It may, however, be ascribed to the fact that the numbers of animals included in the investigation were too small.

One very important fact was clearly proved, however, viz. that earless sheep occur when short-eared rams are used with short-eared ewes. These rams should, therefore, not be used for breeding purposes.

Owing to the shortage of serviceable rams in South Africa, it is practically impossible to eliminate short-eared karakul sheep completely. The use of these rams should, however, be avoided as far as possible.

* "Karakul Sheep" by Lush, Jones and Dickson. Pam. No. 405
Texas Experiment Station.

Planning for Protein.

E. K. Hall, Senior Professional Officer (Animal Husbandry),
Cedara.

ALL feeding-stuffs are composed of moisture, protein, carbohydrate, fats or oils, crude fibre, and mineral matter or ash, in varying proportions. These constituents do not, however, all have the same value in the rations of livestock, the proteins and mineral matter being of great importance in the feeding of farm animals, but unfortunately they are the very ones so often lacking in livestock rations.

The proteins, commonly referred to as the flesh-forming constituents of the rations, contain, among other things, nitrogen. Growing animals and cows in milk require a considerable amount of protein in their rations. Moreover, no other constituent in the ration can adequately take the place of the protein. The fact that there might be an abundance, or even an excess, of one or more of the other constituents in the ration does not compensate for any shortage of protein. Hence, in the case of the dairy cow, if there is any deficiency of protein in her feed, her milk production will be adversely affected, and will drop. A lack of protein is frequently a limiting factor in so far as milk production is concerned, and as long as this condition lasts, cows will not be able to reach or maintain their maximum yield of milk.

It is no exaggeration to say that the majority of milk cows in the Union do not receive sufficient protein in their rations to enable them to reach their maximum yields. An insufficiency of protein is one of the principal causes for the low average yields of milk.

Protein Supplements.

Blood meal, fish meal, carcase meal, and oil cakes are some of the feeding-stuffs which contain the most protein. Unfortunately all the above supplements are in very short supply at present, and as for any improvement in the situation, matters do not look very encouraging or hopeful at the moment. In other words, the farmer will have to depend more upon his own resources, and less upon outside supplies for his protein requirements.

The problem of the farmer is to obtain an adequate supply of protein in order to balance the rations of his livestock. Owing to the shortage of protein-rich supplements, the balancing of rations has become a difficult problem, more particularly for those who were accustomed to buying all their protein supplements in the form of oil cake, carcase meal, eac.

Augmenting Supplies.

The question now arises: "What can be done to augment the meagre supplies of available protein?" The answer to this question lies in the production of leguminous crops. This is the most economical means of making provision for the protein requirements of the various classes of livestock. By careful planning it will be possible, in most cases, to increase the protein supply of the farm, and to make the farm much more self-sufficient in this respect.

Protein is generally the most expensive item in the rations of livestock, and so, in the interests of economical feeding, farmers should endeavour to produce as much of this necessary nutrient as

possible. In many cases it may be possible to produce all the required protein on the farm, and in others, a large proportion of the requirements can be home-grown.

Most of the common farm-produced crops, such as maize, teff or veld hay and silage, are relatively low in their protein content. Consequently rations consisting largely of such feeding-stuffs do not provide sufficient protein for the animals' needs. In other words, if livestock are entirely dependent on these feeds, then their rations will be unbalanced, and particularly so in the case of milk cows and growing stock. Livestock on farms where no legumes are produced, or where no protein-rich supplements are purchased, will, in most cases, not be getting an adequate supply of protein in their rations, i.e. their rations will not be balanced.

In addition to the various legumes, such as soyabeans, cowpeas, lucerne, peanuts, velvet beans, etc., other sources of protein are the oil-bearing seeds, sunflowers and linseed.

Legume hay is particularly valuable livestock feed, because, in addition to the fact that it has a relatively high protein content, it is also fairly rich in minerals, and the usual supply of mineral matter is also in short supply at present. So the legume hays provide two very essential and important constituents in the ration.

Fifteen pounds of high quality cowpea hay can provide sufficient protein for the maintenance of a medium-sized cow and the production of about 2—2½ gallons of milk. This means that if one has an adequate supply of good legume hay on hand, a medium producing herd can get all its protein requirements from this source.

Soyabean seed is very rich in protein, containing about 36 per cent. This figure is higher than that of certain oil cakes. Soyabean seed should, of course, be ground before feeding. It is not very palatable, but if it is introduced into the ration gradually, cows will soon consume fairly large amounts. Cows can be induced to eat it more readily if it is mixed with, say, molasses.

In order to provide an adequate quantity of legume hay for the dairy herd during the winter months, about one ton per head is required—that is feeding at the rate of 10 to 15 pounds per cow per day.

In the rapidly growing stage, grass is rich in protein, and during this period will provide farm animals with most of their protein requirements. More protein can be conserved by converting surplus grass into silage, rather than allowing it to mature on the veld.

As far as the making of veld hay is concerned, a great deal of protein is lost because the grass is cut too late, and consequently the hay has a much lower feeding value. Cutting the veld at the right stage may make all the difference between a hay with a protein content of about 12 per cent. and one containing only about 3 per cent.

By careful planning it will be possible, in most cases, to increase the protein supply on the farm very considerably. Livestock farmers should therefore look well ahead, and plan to grow most, if not all, of their protein requirements during the next planting season. A concerted effort by all concerned will do much towards augmenting the available supplies of protein, and thus avoiding an otherwise acute protein shortage.

The Farm Home.

(A section devoted mainly to the interests of Farm Women.)

The Dress Form.

Elma du Preez, Home Economics Officer, Department of Agriculture.

ANYONE making her own clothes knows how difficult it is to fit a frock on oneself. Nor is it always possible to obtain assistance. A dress form solves this problem and can be made at a small cost to fit the figure. Material can be draped, cut and fitted on such a form. with excellent results.

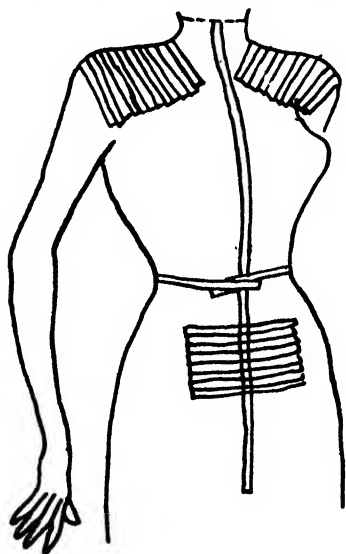


FIG. 1 (a).—One strip down centre front; strips round waist, stomach strips, shoulder strips.

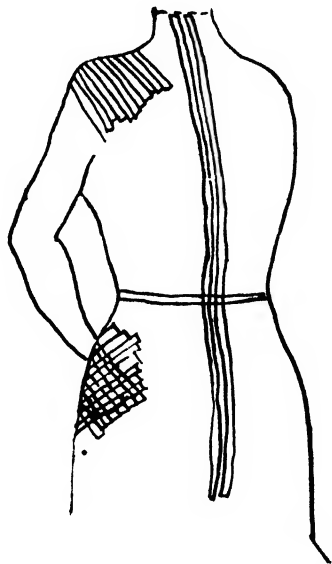


FIG. 1 (b).—Back, hip strips, two strips down centre back.

The form gives one the opportunity of surveying the figure objectively to decide which lines suit the figure best, how good points can be accentuated and defects made less conspicuous.

Requirements.

- (1) 2 cheap well-fitting, short-sleeved, high-necked vests.
- (2) 5 yards of black tape, about $\frac{1}{4}$ -inch wide.
- (3) $1\frac{1}{2}$ rolls of thick gummed paper, about 1-inch wide (obtainable from stationers).
- (4) A piece of thick cardboard or thin board, about 12 in. by 18 in., or larger for a stout person.
- (5) About a $\frac{1}{4}$ pint of mixed shellac.

(6) A few sponges or old rags in saucers of water, a dish and a towel, a pair of scissors, a sharp knife, needles, strong cotton, 4 safety-pins, a tape measure, pencil, long ruler or straight rod and newspapers.

Choose a warm, dry day on which to make the form, and work in an airy room so as to minimize the discomfort suffered by the person acting as model. The model should be feeling fit that day. She should be wearing closely fitting underclothes. For instance, if she wears a corset, she should put on one which fits well and neatly. She should put on a pair of old stockings and comfortable

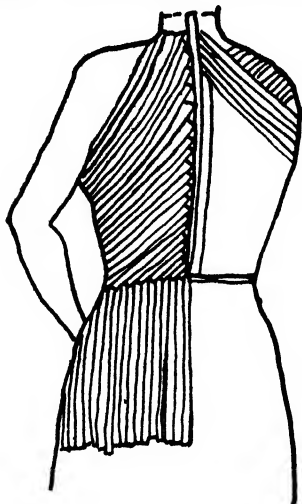


FIG. 2.—Hip layer; first back layer.

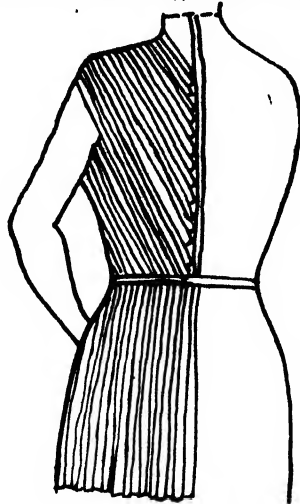


FIG. 3.—Hip strips; second back layer.

shoes with comfortable heels and would be well-advised to wear an old petticoat, in case of damage. The first thing for the model to do is to don one of the vests over the petticoat. If it does not fit the figure smoothly, the extra fullness should be smoothed away by means of darts. The neck is buttoned up high and an extra piece, which can be cut away from the sleeve, or a strip of cheesecloth, is inserted round the neck in such a way that the material stands up smoothly against the neck.

The vest is now pulled well down and pinned to the garters or suspenders with safety-pins. Pin the vest from the inside so that the paper is not pasted over the pins. The figure is now ready for pasting. The model should stand naturally and erect while the pasting is being carried out.

While the model is being dressed someone else can be preparing the paper strips. First cut the following strips:—

3 strips of about 27 inches each, 1 strip, the diameter plus 3 inches.

Now hold the rest of the roll erect and using a sharp knife, cut through the side to the centre at one spot. In this way strips of different lengths are obtained, suitable for pasting over various parts of the body.

The Pasting of the Model.

Three people can paste simultaneously. Special persons for moistening the strips, will facilitate and speed up the process considerably. Paste as follows:—

(1) One 27-inch strip is pasted down the exact centre front from the hollow of the throat.

THE DRESS FORM.

(2) The other two 27-inch strips are pasted down the centre back, about a $\frac{1}{4}$ -inch apart.

(3) The fourth strip is pasted round the waist, following the exact natural line, with the ends overlapping slightly in front on the stomach, as shown in the diagram (Fig. 1A).

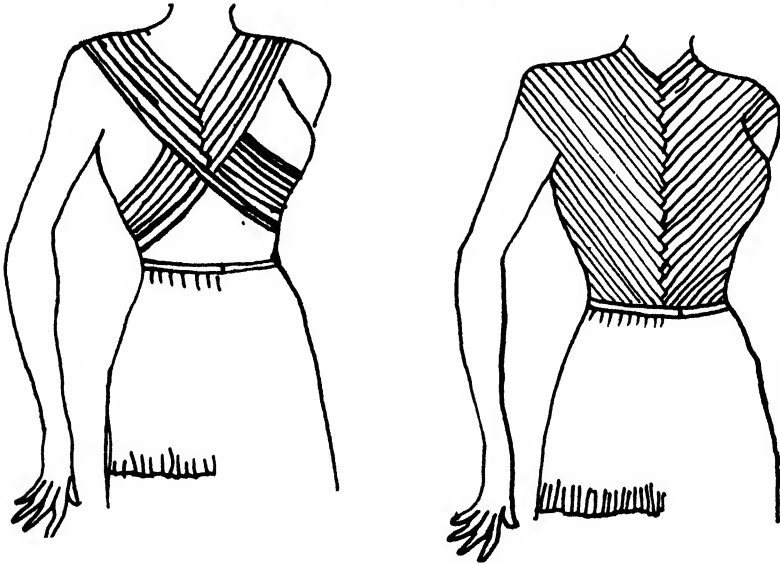


FIG. 4.—Bust, pasted over with a few strips, and completed bust.

(4) Six to eight strips are pasted over the stomach to keep it in position. See that all the strips overlap well. The hips and shoulders can now be pasted simultaneously.

(5) *The shoulder strips.*—Beginning from the neck paste two layers of strips up to the shoulder joint, as illustrated in Figure 1.

(6) *The hips.*—Strips of about 12-14 inches are pasted straight down from the waist with the edges overlapping well. Start from the centre front and centre back and work round to the sides (Fig. 2). Round the hips a second layer, just like the first is pasted over the first layer, to give firmness.

If the dress form is being made for a stouter person, it is desirable to slant the strips round the hips (Fig. 1B), in order to obtain the curve of the hip more easily.

(7) *The Back.*—Start pasting from the neck at the centre of the back and slant the strips down to a position high up under the arm. Continue on both sides of the back till the whole back is covered. Be careful, however, not to paste over the $\frac{1}{4}$ -inch space between the two strips down the length of the back. Now paste a second layer over the back, this time with the strips running from the shoulders and slanting from the underarm to the middle of the back (Fig. 3).

(8) *The Bust.*—Start from the neck with the first few strips and let the strips slant over the bust to the underarm (Fig. 4). The first strip should run over the hollow of the throat. Now a strip is pasted in the same way from the other side (left) of the neck to the right underarm, so that the strips cross.

The strips are now pasted alternately from the two sides so as to interlace. When the bust is reached, however, another method is followed. Starting well below the left arm under the bust, draw the

strip diagonally across up to a point under the right arm, lifting and flattening the bust in the process, as would have been the case had the pasting been started from the top. Now work from the bottom up, interlacing the strips in the same way, till the whole bust is covered (Fig. 4).

(9) *The Neck.*—For the neck, 4-inch strips, slit lengthwise for about an inch at the bottom, are used. Starting under the chin, paste the strips straight down so that the slit end falls on the bust.

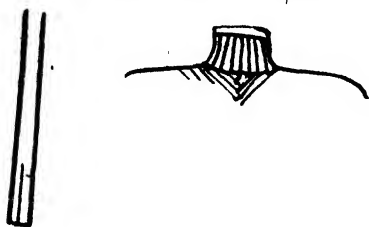


FIG. 5.—Strip for neck with $\frac{1}{4}$ -inch slit; neck pasted.

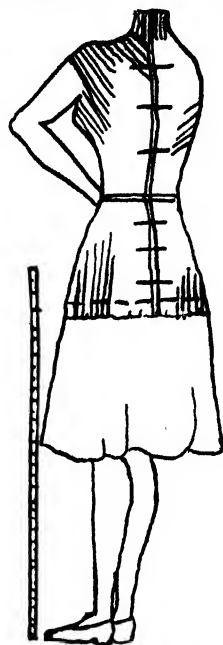


FIG. 6.—Hip line is measured; diagonal-lines.

Now run these strips round the neck with each one again overlapping on the one before. A double layer is again pasted on. Paste one strip round the top of the neck to keep the strips in position (Fig. 5).

The Marking and Removal of the Form.

Measure the distance from the broadest part of the hips to the floor and mark the form at that height all round (Fig. 6). Make a note of the height from the floor.

Now draw diagonal lines across the back of the form over the open $\frac{1}{4}$ -inch space (Fig. 6). Take the waist, bust and hip measurements and note them down.

Now cut the form open along the $\frac{1}{4}$ -inch space at the back, cutting through the vest, and carefully remove the form. Handle carefully so as to make as few dents or creases as possible and press into shape again, where necessary.

Comparison of the measurements of the form with those of the model should not reveal a discrepancy of more than $\frac{1}{2}$ an inch to 1 inch. If desired, this difference may be rectified by pushing the form together slightly at the back.

As soon as the form is removed from the model the open space at the back is pasted over with cross-strips of about 4 to 6 inches. See that the diagonal lines drawn across the back, as in Fig. 8, correspond exactly.

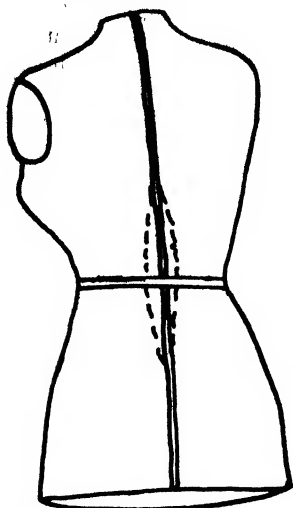


FIG. 7.—How the form is taken in at the waist.

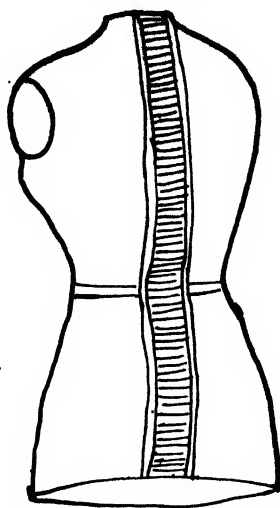


FIG. 8.—Back pasted.

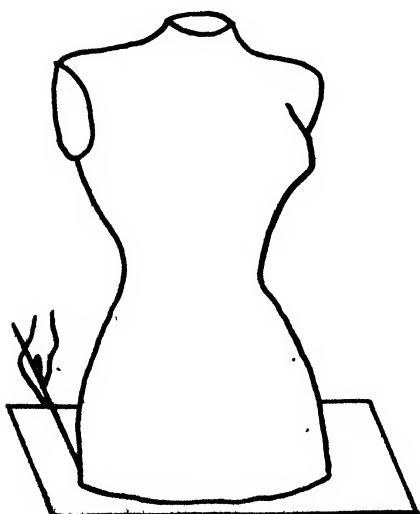
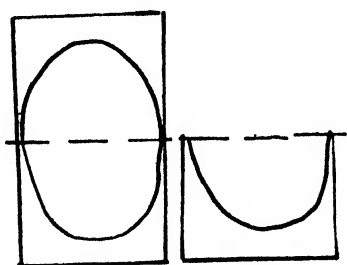


FIG. 9.—Making of paper pattern for base.

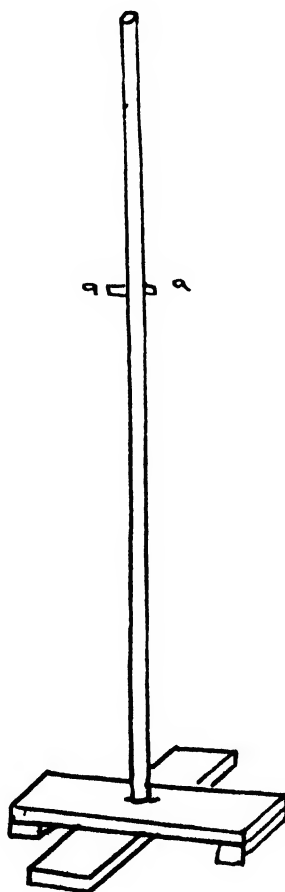


FIG. 10.—Stand for the form.

Now level out the armholes and neck, and also the base of the form according to the marks made around the broadest part of the hips.

Next, the edges of the armholes, neck and base are finished off neatly and firmly with strips pasted from the outside over the edge to the inside, with the edge of the one overlapping that of the one before. The whole inner surface is now pasted over with paper, completely hiding the vest. Now allow the form to dry thoroughly.

Reinforcement with Thin Cardboard and Shellac.

Now place the form on a sheet of paper and trace the outline as shown in Fig. 9. Mark the centre front and back and cut out. See if the paper fits into the form and then cut it out in fibreboard or thick cardboard. Strips of cardboard are cut out in exactly the same way to fit into the neck and armholes.

Make a round hole, about 1 inch in diameter, in the neckpiece. Now fit both the neckpiece and the base into the form and then drop a little ink straight from the hole in the neckpiece on to the base and, taking the inkspot as the centre, make a round hole also about 1 inch in diameter in the base. These holes are necessary for fitting the form to a stand.

All the pieces of cardboard are then fitted in and pasted down with 4-inch strips on the outside. The armholes are left open till last, in order that access may be gained through them for pasting down the neckpiece and base.

The whole form is then painted with shellac. If the paper with which the form has been pasted is fairly thin, a second coating of shellac may be given. Allow to dry thoroughly.

Final Finishing Touches.

Put the second vest on to the form. Close the neck up high by inserting a piece of the sleeve round the neck. Gather the material in so that it fits firmly round the neck, but see that the hole is left open.

Cut away superfluous material and sew the armholes up neatly. Finish off the base in the same way as the neck.

Next, the various lines are marked on the form by sewing black tape, about a $\frac{1}{4}$ -inch wide, along the armholes, shoulder line, neck line, underarm line, hip line, and waist line as well as on the lines at the centre front and back

Stand for the Form.

Any round straight rod can be used for the stand, e.g. a broomstick which fits into the holes in the form. A cross board on which to rest the form should be provided so that the form will be the same height as the person for whom it is made (Fig. 10).

Crops and Markets

A Statistical and Economic Review of
South African Agriculture

by

The Division of Economics and Markets

Volume 26

June 1947

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Price Review for April 1947.*

Fruit.—Except for pineapples and bananas, which were well supplied, the supply of sub-tropical fruit was moderate and the demand generally keen. Firm prices were generally maintained by large quantities of apples. Limited supplies of pears, grapes, guavas and citrus fruits were sold at favourable prices. Good quantities of quinces and spanspeks were available, but owing to the inferior quality they drew little attention.

Tomatoes.—This section was generally well supplied and prices showed a rising tendency.

Onions.—Moderate supplies reached the market. The demand was keen and prices increased.

Potatoes.—Large quantities of potatoes were delivered but the demand was moderate and prices remained firm. The demand for supplies of sweet potatoes was weak.

Vegetables.—Pumpkin varieties, leaf vegetables and green beans were available in excessive quantities, and prices eased. Good supplies of beetroot and cucumbers sold fairly well. Carrot offerings were generally good and prices remained firm at a high level. Green peas were scarce and expensive.

Grain and Fodder.—Arrivals of lucerne hay could not meet the demand. Dry beans were better supplied than dry peas, the latter fetching high prices.

Eggs and Poultry.—Small consignments of eggs made only fair sales, sellers ascribing the position to the high prices. Poultry was well supplied and generally sold well.

* All prices mentioned are averages.

Index of Prices of Field Crops and Pastoral Products.

THE above index, which appears elsewhere in this issue, increased from 203 during the previous month to 205 in April 1947.

The most important changes occurred in the following groups:—

(a) "Hay" increased from 154 to 176 due to a further increase in the prices of lucerne.

(b) "Other Field Crops", i.e. potatoes, onions, sweet potatoes and dry beans increased from 158 to 165, particularly as a result of an increase in the prices of onions and dry beans.

(c) "Poultry and Poultry Products" show an increase from 251 during the previous month to 282 owing to a further increase in the prices of eggs.

Agricultural Conditions in the Union during April, 1947.

Weather Conditions.—Scattered, light showers of rain occurred in all four provinces, but the eastern parts of the country from the Transvaal highveld and north-eastern Orange Free State and Natal, as far as the Transkei, experienced particularly good rains. Severe droughts, however, still prevailed in the western and northern Transvaal, north-western Cape Province and in the south-western Orange Free State.

Crops.—In the north-western Orange Free State, the lowveld and highveld of Transvaal, as well as in the Transkei and Natal, the prospects for summer cereal crops were very promising, while in the northern Transvaal, western Transvaal and southern Orange Free State rain was urgently needed.

Stock and Pastures.—The condition of stock was generally fair. In the north-western Cape Province, south-western Orange Free State and northern Transvaal, however, farmers have already suffered stock losses, and some have had to trek with their stock to areas with better grazing. Except for lumpy skin disease which still occurred in the western and south-western Cape Province, and for lumpy skin disease and nagana in Natal, stock diseases in general were quiet.

Review of the Wool Market during April 1947.

During April 1947 a total of 41,888 bales of wool was offered for sale at auction in Union harbours, and 30,193 bales (73 per cent.) were sold. This quantity was less than that offered in March 1947, while the prices for April were on a higher level than those of March.

Sales were generally steady and there was a brisk demand on the markets for all free wool, short wool and lambs' wool. Karoo and grassveld wools were well represented, and kaffir wool sold well. The demand for karakul wool was weak. At the end of the month buyers were generally more discriminating and cautious.

Prices and Winter Premiums of Dairy Products 1946/47 Season.

As a result of the abnormally poor conditions which prevailed in 1946 and the appreciable increase in costs, particularly of feed-stuffs, the basic price of butterfat was increased by 1d. per lb. to 2s. 2d., 2s. and 1s. 10d. per lb. for 1st, 2nd and 3rd grade butterfat, respectively as from 1 November 1946, and cheese milk by $\frac{1}{2}$ d. per gallon to 11 $\frac{1}{2}$ d. (or 2s. 7 $\frac{1}{2}$ d. per lb. butterfat contained therein), while the usual 1d. per gallon difference between the producer's price of condensing milk and cheese milk in favour of condensing milk was also maintained, i.e. the producer's price for condensing milk was fixed at 12 $\frac{1}{2}$ d. per gallon (or 2s. 10d. per lb. butterfat).

The output of butter and cheese has nevertheless continued to decline and in order to encourage the producers to make an additional effort to provide winter feed and maintain the production of dairy produce during the coming winter, it has been decided to increase the winter premiums on butterfat and cheese milk substantially and to increase the producer's price of condensing milk correspondingly.

The winter premium on butterfat will be increased by 3d. per lb. and will therefore be 7d. per lb. during June 1947 and 9d. per lb. from 1 July to 31 October 1947. The winter premium on cheese milk will be increased by 1d. per gallon and will thus be 3d. per gallon during June 1947 (or 8 $\frac{1}{2}$ d. per lb. butterfat) and 3 $\frac{1}{2}$ d. per gallon (or 9 $\frac{1}{2}$ d. per lb. butterfat) from 1 July to 31 October 1947.

The price of condensing milk has accordingly been fixed at 1s. 3 $\frac{1}{2}$ d. per gallon (or 3s. 6 $\frac{1}{2}$ d. per lb. butterfat contained therein) for June 1947 and 1s. 3 $\frac{3}{4}$ d. per gallon (or 3s. 7 $\frac{3}{4}$ d. per lb. butterfat) as from 1 July to 31 October 1947.

Maximum Prices of Oat Hay.

THE maximum prices of oat hay as fixed on 11 January 1946 (see *Crops and Markets* of March 1946) have now been slightly amended.

The maximum producer's price of unbaled and baled oat hay remains unchanged at 4s. 6d. and 5s. 3d. per 100 lb., respectively, free-on-rail seller's station.

In the case of resale, 9d. per 100 lb. may be added to the above-mentioned price, plus railage and 1d. per 100 lb. per mile transport cost.

In the case of cut oat hay (in bags or baled) the maximum price at which the manufacturer may sell, is raised to 8s., 7s. and 2s. 9d. per 100 lb. for first, second and under second grade, respectively. Wholesale prices are raised to 9s., 8s. and 3s. 9d. per 100lb. respectively, plus railage and transport costs at 1d. per 100 lb. per mile which may be added to the above price.

(See *Government Gazette Extraordinary* of 9 May 1947.)

The Marketing of the 1946/47 Maize Crop.

THE following prices (per 200 lb.) to producers have been fixed for maize as from 1st May, 1947:—

	Grades 2, 4 and 6.	Grades 3, 5 and 7.	Grade 8.
	s. d.	s. d.	s. d.
In bags.	21 3	21 1	20 10
In elevators.	20 0	19 10	19 7
In bulk at depots of storage agents.	19 7	19 5	19 2

The above prices are free-on-rail senders' station.

These prices are based on 2s. each for new grain bags at which price bags will be stabilized by the Government. The corresponding prices at which grades 2, 4 and 6 of maize were fixed for the previous season were 22s. 6d. per 200 lb. in bags, and 21s. 2d. per 200 lb. in elevators.

Last year an advance price of 20s. per bag was announced for the present maize crop. There is, however, an increase in costs of about 3d. per bag in the price of bags, while increased labour costs in harvesting and threshing are estimated at 1s. per bag, so that the bagged price was increased to 21s. 3d. for the coming season.

The minimum price of seed maize has been fixed at 21s. 3d. per bag.

During the past season a consumer's subsidy of 5s. per bag was paid by the Government. This was made possible by the permit system then in operation, otherwise the large difference between producer and consumer prices would have resulted in a temptation for producers to sell all their maize and buy their own requirements back again at the lower price. The permit system prevented such a practice from developing. This year, with more maize available, the permit system has been withdrawn and it was therefore necessary to adjust prices in such a way that producers' selling prices do not exceed their buying prices by an appreciable amount. The selling prices to consumers have thus been increased by 1s. 7d. per bag to 20s. 3d. per bag for maize in bulk, with the bagged price to the producer at 21s. 3d. To cover this difference of 1s. between the Maize Board's buying and selling prices, as well as the cost of storage of maize (which will be high this year on account of the lack of bags and the necessity to improvise bulk storage), the Government will still be required to pay a subsidy of 3s. 1½d. per bag.

Furthermore a subsidy of 1s. per bag (of 200 lb.) of mealies milled will be paid to millers, while the miller's levy has also been reduced from 4d. to ½d. per bag. Although the Board's selling price for maize has thus been increased by 1s. 7d. per bag, it was possible to increase the consumer's price of milled maize products by only about 4d. per bag for the present season.

(See *Government Gazette Extraordinary* of 2 May, 1947.)

Prices of Slaughter Stock for the 1947/48 Season.

Prices of Slaughter Cattle.—Prices of slaughter cattle in the controlled areas for the coming season will remain unchanged except that the seasonal increase in prices will be raised from 15s. to 17s. 6d. per 100 lb. dressed weight, while the seasonal increase in the prices of grade 4 beef will be only 12s. 6d. per 100 lb.

To offset the expenditure connected with the higher seasonal prices, the basic producers' prices will be reduced by 1s. per 100 lb. as from 12 May 1947. In the case of Cape Town, however where in the past basic prices were 1s. per 100 lb. more than for the Witwatersrand area, the basic prices are now reduced by 2s. to bring it into line with that in the Witwatersrand area, seeing that the official prices in these two areas are now on the same level. The prices of beef cattle in the Durban-Pietermaritzburg area are, in comparison with those of the Witwatersrand area, also increased by 1s. per 100 lb. so that prices there are now only 2s. instead of 3s. lower than in the Witwatersrand area. This has been done to attract larger supplies to the Durban-Pietermaritzburg area. It has also been found that a premium of 1s. 6d. per 100 lb. above prices in the Witwatersrand area has been necessary to attract adequate supplies to Pretoria, and prices in the latter area were raised accordingly. Over and above the seasonal increase of 17s. 6d. per 100 lb., producer prices in the Cape Town, Durban and Pietermaritzburg areas will be increased by a further 2s. per 100 lb. as from November onwards to 19s. 6d., and in the case of grade 4 to 14s. 6d. The seasonal increase commences as from 15 June, with 1s. per 100 lb. rise per week, and reaches the peak about the beginning of November. For Durban and Pietermaritzburg, the seasonal increase, however, commences a week earlier, viz. on 8 June. In spite of these changes in producers' prices, consumers' prices will remain unchanged.

Sheep and Goat Prices.—Slaughterings of sheep, goats and lambs declined considerably since 1941 because of the decline in the small-stock numbers. An increase, especially in the sheep population of the Union, is thus desirable. For that reason the Government decided to raise the producers' prices of lamb and of super, prime and grade 1 mutton and grade 1 goats' meat by an average of 1d. per lb. dressed weight. Since certain adjustments in prices between the different controlled areas were necessary to ensure a more even distribution of supplies between these areas, the actual increase in producers' prices will be as follows.—Cape Town, 1½d. per lb; Witwatersrand, Pretoria, Durban and Pietermaritzburg, 1d. per lb; and Port Elizabeth, East London, Kimberley and Bloemfontein, ¾d. per pound.

For grade 2 goats' meat and mutton which are consumed largely by the lower income groups, the price increase to producers will be ½d. per pound for all areas, except for Cape Town where it will be ¾d. per pound.

This price increase will take effect from 9 May 1947 and will cause a slight increase in consumers' prices.

Prices of Pigs.—Pig production decreased considerably during the past season because of a shortage of feeds. With the improvement in the feedstuff position it is, however, also desirable to encourage the expansion of pig production in order to supplement the meat supply of the country, particularly as it can be done in a comparatively short period. Because of this, producers' prices of grade 1

and 2 porkers were raised by 1d. per lb. dressed weight and that of sausage pigs and larders by ½d. per lb. The increase in the prices of pigs takes effect as from 12 May, 1947.

(See *Extraordinary Government Gazette* of 9 May 1947.)

The new basic prices of slaughter stock for the 1947-48 season are given in the following table.

	Cape Town.	Durban and Pietermaritzburg.	Pretoria.	Witwatersrand.	East London, Bloemfontein, Port Elizabeth, Kimberley.
	s. d.	s. d.	s. d.	s. d.	s. d.
<i>Calves per lb.—</i>					
Grade I.....	0 8	0 8	0 8	0 8	0 8
Grade II.....	0 6	0 6	0 6	0 6	0 6
<i>Pigs per lb.—</i>					
Suckers, super.....	1 3½	1 3½	1 3½	1 8½	1 3½
Porkers Grade I.....	1 0½	1 0½	1 0½	1 0½	1 0½
Porkers Grade II.....	0 11	0 11	0 11	0 11	0 11
Baconers Grade I.....	1 8	1 3	1 3	1 8	1 8
Baconers Grade II.....	1 0½	1 0½	1 0½	1 0½	1 0½
Sausage pigs.....	0 9½	0 9½	0 9½	0 9½	0 9½
Larders.....	0 8½	0 8½	0 8½	0 8½	0 8½
Roughs.....	0 6	0 6	0 6	0 6	0 6
Undergrade pigs.....	0 3½	0 3½	0 3½	0 3½	0 3½
<i>Cattle per 100 lb.—</i>					
Super.....	66 0	64 0	67 6	66 0	63 0
Prime.....	57 0	55 0	58 6	57 0	54 0
Grade I.....	49 0	47 0	50 6	49 0	46 0
Grade II.....	42 0	40 0	43 6	42 0	39 0
Grade III.....	35 0	33 0	36 6	35 0	32 0
Grade IV.....	21 0	19 0	22 6	21 0	18 0
<i>Lambs per lb.—</i>					
Super.....	1 1½	1 1½	1 1½	1 1½	1 0½
Prime.....	1 0	1 0½	1 0½	1 0½	1 1½
Grade I.....	0 11½	1 0	0 11½	0 11½	0 10½
<i>Sheep per lb.—</i>					
Super.....	0 11½	1 0½	1 0	0 11½	0 11
Prime.....	0 10½	0 11½	0 11	0 10½	0 10
Grade I.....	0 9½	0 10½	0 10½	0 10	0 9½
Grade II.....	0 7½	0 8	0 7½	0 7½	0 7
<i>Goats per lb.—</i>					
Grade I.....	0 8½	0 9	0 8½	0 8½	0 7½
Grade II.....	0 6½	0 7	0 6½	0 6½	0 6½

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannesburg. Table.	Durban.	Cape Town.
1938-39.....	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40.....	8 8	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1940-41.....	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1941-42.....	12 5	12 8	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1942-43.....	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1943-44.....	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1944-45.....	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1945-46.....	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1946-47.....									
January.....	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February.....	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 8	17 2
March.....	11 4	12 4	9 9	12 10	12 9	13 5	18 5	14 8	14 6
April.....	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May.....	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June.....	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July.....	11 10	14 3	12 0	15 0	15 2	15 6	15 11	15 2	17 4
August.....	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September.....	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October.....	24 9	23 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December.....	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	23 5
1947-48.....									
January.....	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 8
February.....	14 3	14 6	11 9	13 7	16 1	17 8	16 11	7 6	18 11
March.....	17 6	18 7	14 3	20 3	13 4	17 6	15 6	18 4	18 1
April.....	20 7	22 2	18 0	22 3	24 11	24 4	12 7	8 4	10 11

CROPS AND MARKETS.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Com- bined index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39.....	92	109	96	89	79	102	106	94	93
1939-40.....	86	114	77	95	115	105	106	89	104
1940-41.....	108	120	106	156	102	108	110	103	109
1941-42.....	120	144	143	203	102	131	135	136	124
1942-43.....	160	157	144	159	122	147	163	167	147
1943-44.....	170	186	137	212	122	154	185	188	159
1944-45.....	183	186	180	281	122	177	179	184	164
1945-46.....	201	194	164	312	118	198	185	170	170
1946—									
January.....	198	194	191	347	118	204	188	204	174
February.....	198	194	158	305	118	186	184	224	171
March.....	198	194	160	280	118	186	181	241	171
April.....	198	194	176	298	118	186	180	279	174
May.....	249	194	170	284	119	186	177	289	184
June.....	246	194	178	287	119	218	178	260	184
July.....	245	194	182	303	120	231	183	193	182
August.....	242	194	181	319	120	231	188	164	181
September.....	243	194	183	351	163	231	196	156	198
October.....	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December.....	242	210	157	236	168	194	208	201	200
1947—									
January.....	242	210	144	174	178	194	200	238	202
February.....	240	210	127	157	187	194	191	248	203
March.....	240	210	154	158	189	194	182	251	203
April.....	239	210	170	165	190	191	182	282	205

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.

(d) Potatoes, sweet potatoes,
onions and dried beans.
(e) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and
condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johan- nesburg (a) 100 lb.	KAFFIROORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (a).		
	Cape.	Trans- vaal.			K1.	K2.	Speckled Sugar	Cow- peas	Kid- ney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.....	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.....	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 8
1942-43.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.....	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.....	6 4	5 4	7 2	4 9	18 8	18 8	88 7	89 6	70 6
1946—									
January.....	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February.....	6 0	5 10	8 1	5 9	20 6	20 6	90 8	60 3	69 4
March.....	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 8
May.....	6 10	5 1	7 6	4 6	60 11	69 11	90 6	52 11	75 7
June.....	7 3	5 6	7 6	4 5	60 8	60 8	94 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	50 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1947—									
January.....	5 10	5 11	7 5	3 8	38 9	48 9	61 4	38 11	51 4
February.....	5 0	4 10	7 5	3 11	40 11	40 11	44 8	38 6	44 8
March.....	6 3	5 10	7 5	3 11	40 8	40 8	47 1	35 1	40 3
April.....	7 1	6 10	7 8	4 7	38 4	38 4	55 7	42 3	56 1

(a) Municipal Market.
(b) Seasonal year for kaffircorn.
1 June-31 May.

Dry Beans, 1 April-31 March,

Lucerne and teff, 1 July-
June.

Index of Prices Paid for Farming Requisites.

Year and Month.	Imple- ments.	Ferti- lizers.	Fuel.	Bags.	Feeds.	Fencing Material.	Dips and Sprays.	Building Material.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Basis—								
1936-38...	100	100	100	100	100	100	100	100
1942.....	123	157	140	206	136	229	117	168
1943.....	144	171	154	237	152	239	127	179
1944.....	161	184	156	307	155	240	134	184
1945—								
January...	159	204	156	310	162	225	136	181
April.....	159	204	156	311	163	224	136	181
July.....	159	204	156	321	169	225	135	180
October...	159	204	146	321	166	225	135	179
1946—								
January...	155	204	146	314	168	218	135	174
April.....	152	204	146	304	163	213	134	174
July.....	152	199	130	308	167	214	134	176
Oct.....	153	199	131	308	163	215	134	177
1947—								
January...	163	199	131	325	166	216	134	184
April... (j.)	164	199	123	525	172	217	137	186

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

- (a) Ploughs, planters, seed-drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, shares, land sides, mouldboards, mowers, knives, pitmans, guards.
- (b) Superphosphate, ammonium sulphate, muriate of potash.
- (c) Petrol, power paraffin, crude oil, grease, lubricating oil.
- (d) Woolpacks, grain bags, sail twine, binder twine.
- (e) Mealies, oats, lucerne, groundnut oil-cake meal, bonemeal, salt.
- (f) Fencing wire, standards, baling wire.
- (g) Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip Little's dip, Tixol cattle dip.
- (h) Corrugated iron, deals, cement, lime, flooring boards.
- (j) Preliminary.

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[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

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- (3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
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Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ... AFRICA

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Editorial:

Increased Food Production Through Fertilization.

IT is clear that with the country's increased purchasing power as well as the fertilizer shortage of the past few years, the farmer in South Africa finds it increasingly difficult to meet the nation's food requirements. The pre-war days of surplus production are a thing of the past and to-day the South African representatives are also queueing up where the world's basic food is being distributed overseas. During the past year attempts have been made to import not only wheat, supplies of which have always been inadequate, but also oil seeds, oils, meat and maize. Furthermore, land must also be made available for the production of fibres for the manufacture of bags.

The industrial development accompanying the expansion of the coal, gold and steel industries means that so many more workers will be prepared to pay for their food. It is the farmer's business to provide this food and a judicious approach will redound both to his own advantage and to that of his country.

The time has come to make plans for the coming summer and the profitable use of fertilizers is an important weapon in the struggle for higher and more profitable food production.

The country's fertilizer requirements—especially her phosphate requirements—have doubled since 1940. Although the supply is still inadequate, there has been a noticeable improvement and the government is leaving no stone unturned to make good this shortage. The problem with which we are faced, however, is how to utilize the available supplies in the most effective manner and certain principles learnt from experience must therefore be borne in mind.

It would be out of place at this stage to argue about the merits of organic fertilizers as opposed to those of artificial fertilizers. Both are scarce and farmers should help themselves as far as possible by making compost.

Phosphatic fertilizer is excellent under dryland conditions and is eminently suitable for crops such as maize and groundnuts. In damper areas 300-400 lb. of super phosphates (if available) per morgen are recommended and 200 lb. for the drier parts. It has repeatedly been proved that in large portions of the country, maize can be successfully cultivated year after year if properly fertilized with superphosphates. The grain yield is easily increased by 10—20 per cent. and this means at least an extra 2,000,000 bags of maize for the granaries of the country.

Where fertilizer was applied during the past summer, some legume such as cowpeas, groundnuts or soybeans may be planted this year. These crops will all be able to benefit considerably from the residual affect of last year's application of supers. There is a

world shortage of oils and unless sufficient quantities of oil-bearing seeds are produced, there will be a shortage of edible oils as well as oil paint and soap, to say nothing of the valuable seed cake meal so essential to dairy cattle.

The sources in China and India have suddenly dried up and while there is a food shortage in those countries, we should produce our own oil plants as far as possible.

Heavily fertilized soils for the recent large potato crop, may now be used unfertilized for other crops in order that the maximum benefit may be derived from the residual effect of the fertilizers. It is also useful to bear in mind that the higher the productive capacity of the soil, the more profitable heavy applications of fertilizer will be. Holland and Belgium which have some of the most fertile soils in Europe, use more fertilizer in proportion to their area than less fertile areas. This principle may also be applied in South Africa on valuable soils under irrigation. It has been proved at Vaalhartz that it is very profitable to use as much as 1,200 lb. super per morgen annually for lucerne. To-day the price of lucerne is high and more lucerne means more food in the form of eggs and dairy and meat products. Moreover, the farmer who cultivates lucerne, renders his soil a service. Practically any crop may be cultivated unfertilized on an old lucerne land ploughed again, provided that the lucerne was well fertilized. The cultivation of lucerne on drylands, especially in the Orange Free State and the western Cape Province is a very popular practice and the soil should receive a heavy application of super phosphates shortly before the crop is sown. In addition, agricultural lime is essential to the successful cultivation of this crop, especially on acid soils where the rainfall is favourable.

Nitrogenous fertilizers are used mainly for sugar cane, fruit and vegetables and for wheat in the western Cape Province. Maize shows practically no response to this plant food and nitrogen is too expensive to be wasted in this way. It is much better to save it for wheat or for top dressing of vegetables, tobacco or fruit trees.

Fruit and vegetable farmers who use large quantities of kraal and Karroo manure annually, must think of the future; fertilizer will undoubtedly play a larger rôle in their future farming practices. The fertilizer shortage since 1941 has expedited the exploitation of manure to such an extent that at present the South African Railways transport almost 400,000 tons annually to the most important food producing areas. The question arises as to how long the supply will be able to keep pace with this enormous consumption. Manure, the fertilizer accumulated for many years, is now being taken from kraals throughout the country and at this rate it will be impossible to keep up the supply indefinitely. The farmer should therefore supplement the available fertilizers with phosphatic fertilizer in order to ensure good crops with half the quantity of Karroo manure. Animal fertilizers are relatively rich in nitrogen but poor in phosphates and heavy applications therefore result in the wastage of much of the former expensive constituent.

The use of ground Karroo manure for maize is not recommended since an application of as much as 800 lb. per morgen cannot provide sufficient phosphates to the plant and, in addition, most of the nitrogen is wasted. For the same amount the farmer can buy 75 per cent. more fertility in the form of crude manure.

Potash supplies are kept for tobacco, potato and fruit farmers and the cheapest source of potash to-day is to be found in Karroo manure which contains almost 5 per cent. potash in the dry material.

Classification of Skins.

THE Hide and Skin Committee of the Livestock and Meat Industries Control Board has, in consultation with interested parties in the hide and skin trade, fixed the following grades for all the controlled centres, which will come into operation on 1 July 1947.

Merinos.

Combings:—All merino skins derived from sheep slaughtered at the controlled abattoirs with a minimum length of 2 in. and over.

Longs:—Same as above but with a length of 1½ in.-2 in.

Mediums:—Same as above with a length of 1 in.-1½ in.

Shorts:—Same as above but with a length of ½ in.-1 in.

Pelts:—Same as above but with a length of up to ½ in.

Close Shorn or *White Shorn* are pelts that are newly shorn.

The average length of the wool on a skin should indicate the grade. For example, if the wool on the skin is from 2 to 3 inches in length, the grade is a *Combining Skin*; if the length varies from 1½ to 2½ inches, the indicated grade is a long-wool skin. The minimum average length therefore indicates the grade.

The wool of all merino skins must show definite merino characteristics. Spinning count and quality should not be taken into consideration in the grading of merino skins.

Coarse and Coloureds.

The Coarse and Coloured grades shall contain all skins of cross-bred sheep (Merino × English breeds), purebred English breeds such as English long and short-wool breeds, Merino × Africander (or Persian), English breeds × Africander (or Persian) and Karakul × Africander. All sheep skins not conforming to the Glover or Merino types should be graded into this line. Black merinos or coloured wool skins are also classed in these grades. *On no account must close-shorn Coarse and Coloured be classed as Merino Close Shorn.*

Karakul Skins.—These are skins derived from the purebred karakul sheep. The number of karakul skins received at the controlled centres is very small and the bulk of the so-called karakul skins actually consists of Coarse and Coloured because the karakul breeder kills the lambs when a few days old, and the only karakuls received at the abattoirs are old ewes that are unfit for breeding purposes. As there is hardly any difference between the average karakul skin and the Coarse and Coloured, it is suggested *that all karakuls be graded with the Coarse and Coloureds* and be sold at the same price as this grade.

Long:—Coarse and Coloured Skins with a wool length of 1 in. and over.

Short:—Coarse and Coloured Skins with a wool length up to 1 in.

Capes or Glovers.

These may be described as the grade which contains all the hairy and kempy sheep skins. An allowance should be made for a certain quantity of wool on the skin. The following breeds produce this type:—

(1) Africander (Ronderib, Gladdehaar or Blinkhaar and the fat tail).

(2) Blackhead Persian or White Persian.

(3) Persian × Africander.

Large Glovers consist of skins of the above type with a good spread.

Small Glovers are skins of the above type with a poor spread.

(Issued by the Livestock and Meat Industries Control Board.)

Prices Through Three War Periods.

Professor F. R. Tomlinson, Agricultural Research Institute, Pretoria.

DURING the past half century the South African nation has gone through three periods of high prices as a result of wars. It is the purpose of this article to compare the relative increases in prices during these three periods and to compare the movement of agricultural prices with the general wholesale price index as well as with certain groups of retail prices. It is an old saying that history repeats itself, although this is not necessarily true of economic trends. The price trends which followed on the first two wars can, however, serve as an indication of what can be expected sooner or later in the present post-war period. The date of the turning point in the present upward price trend can, however, not be predicted even approximately. There are too many factors involved in the present situation and it is impossible to determine the effect on prices of each of this multitude of factors.

In Fig. 1 the price trends of crops and animal products are represented graphically during three war periods in South Africa, namely the Anglo-Boer War, World War I and World War II (*). In order to compare the relative price increases and declines during separate periods a uniform base is not used throughout; the trend during each war period is compared with its own pre-war base.

TABLE I.—*Index numbers of prices of crops and livestock products* ⁽¹⁾ *in South Africa* ⁽²⁾ *during three war periods.*

Anglo-Boer War ⁽³⁾ . (1897-1898 = 100.)		World War I ⁽⁴⁾ . (1913-14 = 100.)		World War II ⁽⁴⁾ . (1938-39 = 100.)	
Year.	Index.	Year.	Index.	Year.	Index.
1898	105	1913-14	100	1938-39	100
1899	106	1914-15	98	1939-40	98
1900	114	1915-16	103	1940-41	112
1901	119	1916-17	115	1941-42	135
1902	127	1917-18	123	1942-43	159
1903	138	1918-19	129	1943-44	177
1904	106	1919-20	189	1944-45	185
1905	119	1920-21	161	1945-46	195
1906	99	1921-22	97	1946-47	213 ⁽⁵⁾

(1) Excluding prices of wool, mohair, hides and skins.

(2) Prices for the period 1898 to 1906 are only for the Cape Colony and not for the Union of South Africa.

(3) Calculated from *Agricultural production and prices in the Cape Colony, 1849-1909*, by F. R. Tomlinson, unpublished manuscript, University of Pretoria.

(4) Prices for the period 1913-14 to 1921-22 and 1938-39 to 1945-46 are taken from Report of the Marketing Council on the Marketing Control Boards, 1938 to 1946, U.G. 27 of 1947, page 4.

(5) Represents average for nine months and obtained from Division of Economics and Markets. Special acknowledgment and appreciation go to Mr. A. J. du Plessis of the Division of Economics and Markets who was responsible for the construction of the combined agricultural price index from 1911 to date.

* This price index excludes prices of wool, mohair, hides and skins and is referred to in this article as the "agricultural price index."

PRICES THROUGH THREE WAR PERIODS.

A few outstanding characteristics of the price movements during the three periods can be deduced from the figure. Firstly, each war period brought about a strong price increase. Secondly, the peaks in prices occurred after the cessation of hostilities. Thirdly, prices underwent a sudden decline in the case of the first two war periods. After reaching the peak in 1903, prices declined during the following year to below the pre-war level, then increased again slightly, but declined again to below the pre-war level. In the case of World War I prices, after reaching a peak in 1920, declined within two years to below the pre-war average. It is impossible to predict a similar sudden decline after the peak has been reached in the present post-war period. The possibility of such a decline cannot, however, be ruled out. The fourth important feature of agricultural price movements during the three war periods was that the peak in each case was higher than the previous one. In the case of the Anglo-Boer War the peak was only 38 per cent. above the pre-war average as compared with 89 per cent. in the period of World War I. The most recent available prices indicate that the agricultural price index is 113 per cent. above the pre-war average. This high increase has happened in spite of strong price control measures applied to agriculture since the beginning of the war. Agricultural prices would undoubtedly have soared much higher if no price control measures were applied during the past war.

The above comparisons in the increase of agricultural prices are made with each pre-war period as base for the increase following it,

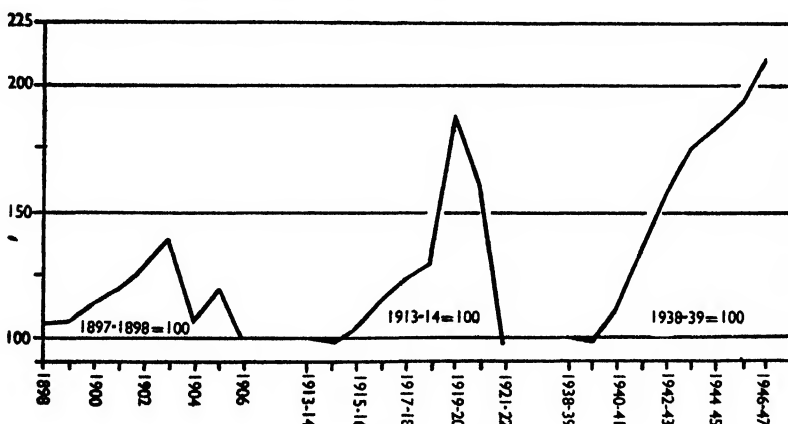


FIG. 1.—Index of agricultural prices in South Africa during three war periods (see Table 1).

e.g. 1913-14 as base for the period of World War I and 1938-39 as base for the period of World War II. In order to compare the actual level of agricultural prices during the two war periods, the same base should be used for both periods. With 1913-14 as base, agricultural prices reached a peak of 189 in 1919-20 (See Table I). On the same base the most recent index (index 213 on base 1938-39, see Table I) comes to 190. The actual level of the agricultural price index used in Figure 1 is therefore at present more or less as high as the peak during the First World War period.

The present high level of agricultural prices has many advantages to producers as long as that high level lasts, but inherently it holds many dangers for the future. Farmers who are perhaps under the impression that the present high level of prices can be maintained

and who make investment plans on the basis of the present level, may expect a great shock in the future. Purchasing of farms at present land values (which are closely tied to the increasing price level) should in general be strongly discouraged. It is a general economic fact that on a downward movement of agricultural prices, farming costs do not move in close relationship with such prices. A large part of agricultural costs is relatively fixed and does not move in relation with the agricultural price level at all. A high farm indebtedness is of all fixed costs the most dangerous at present.

Wholesale Prices.

It has been shown above that during two previous war periods agricultural prices declined to below the pre-war level. The general wholesale price level of all commodities is less elastic. It also declined sharply after World War I, but not as low as agricultural prices.

The index numbers of wholesale prices of all commodities in South Africa are shown in Figure 2 for the periods 1914 to 1922 and 1939 to 1947. During the past war the general price level of all commodities was reasonably kept in check. At present, however,

TABLE II.—*Index numbers of wholesale prices of all products during two war periods in South Africa.*

World War I. ⁽¹⁾ (1914 = 100.)		World War II. ⁽²⁾ (1939 = 100.)	
Year.	Index.	Year.	Index.
1914	100	1939	100
1915	110	1940	111
1916	127	1941	122
1917	145	1942	137
1918	158	1943	149
1919	170	1944	154
1920	230	1945	156
1921	166	1946	160
1922	133	1947	163 ⁽³⁾

(1) Data for period 1914 to 1922 are taken from official year-books of the Union of South Africa and re-calculated to 1914 as base.

(2) Data for period 1939 to 1947 are taken from Monthly Bulletin of Statistics, Office of Census and Statistics, Pretoria, and re-calculated to 1939 as base.

(3) Average for first quarter of 1947.

this index is not far below the 1919 level, but a sharp increase such as that which took place in 1920, has been absent up to the present. The wholesale price index in 1939 was, however, considerably higher than in 1914. If the 1946 level is compared with 1914 as base it stands at an index of 168 in comparison with 170 in 1919. For practical purposes we can therefore assume that the wholesale price index is at present at the same high level as in 1919. The question at present, and one to which no reply can be given, is whether this price index is near its peak.

A comparison between the agricultural price index shown in Figure 1 and the general wholesale price index shown in Figure 2 is important. In comparing the present level of both series of index numbers on the pre-war basis one has to conclude that the agricultural price index is to some extent high in relation to the

PRICES THROUGH THREE WAR PERIODS.

wholesale price index of all commodities. The history of prices teaches us that over a long period agricultural prices cannot be out of relation with the general wholesale price index for long. A return of agricultural prices to a level at least in relation with the general price index will therefore have to take place sooner or later.

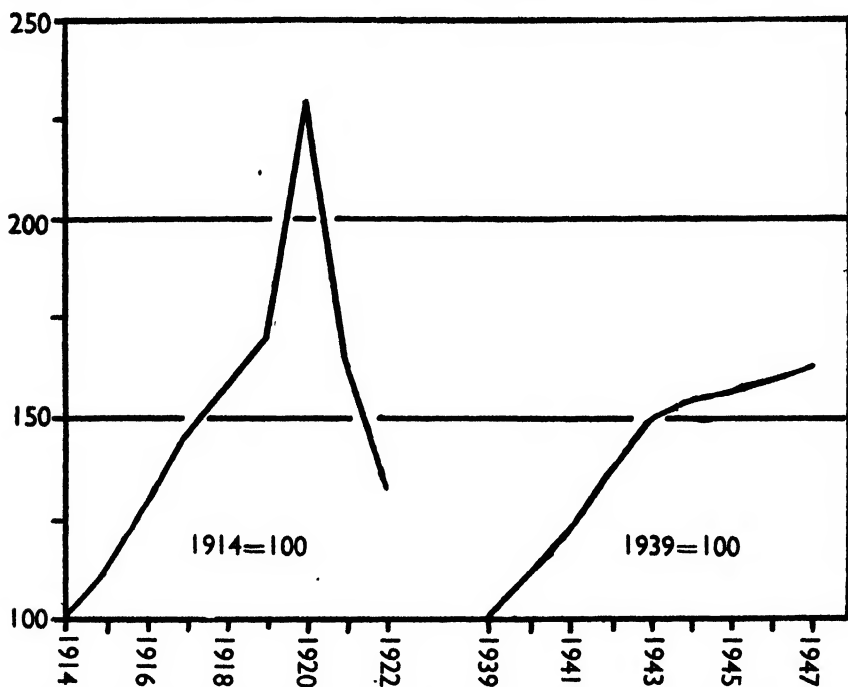


FIG. 2.—Index numbers of wholesale prices of all commodities in South Africa during two war periods. (See Table II.)

Retail Prices.

The consuming public, especially the pensionary, salaried person and wage earner, is interested mainly in retail prices. These prices are, of course, closely related to the general wholesale price index and to the agricultural price index. In Figure 3 are shown the index numbers of retail prices for food, fuel, light and rent, and in Figure 4 the index numbers for food only during three war periods in South Africa..

The index of retail prices (*) in Figure 3 measures the changes in the retail prices of a fixed series of articles and services between certain dates. No allowance is made, however, of changed consumption structures. Consequently these indexes are not indexes of cost of living and should not be interpreted as such. It does, however, remain our best measure of changes in the cost of living. In this analysis we are interested mainly in the trends of retail prices during the three war periods, as well as in the comparison of these trends with trends in the other price series already discussed.

* This index is used and not the index of retail prices which also includes "diverse articles" mainly for two reasons: firstly, because the former index is more reliable prior to 1938 than the latter, and secondly, because it is available for an uninterrupted period since 1895. This index is referred to in this article as the "retail price index".

TABLE III.—*Index numbers of retail prices of food, fuel, light and rent in South Africa during three war periods.*

Anglo-Boer War (*). (1897-1898 = 100.)		World War I (*). (1914 = 100.)		World War II (*). (1938 = 100.)	
Year.	Index.	Year.	Index.	Year.	Index.
1898	101	1914	100	1938	100
1899	102	1915	103	1939	100
1900	106	1916	106	1940	102
1901	115	1917	114	1941	106
1902	119	1918	118	1942	115
1903	109	1919	126	1943	121
1904	103	1920	155	1944	125
1905	97	1921	137	1945	129
1906	99	1922	121	1946	131
1907	88	1923	120	1947	134 (*)
1908	87	1924	123	April 1947	136.4

(1) Data for the period 1898 to 1908 taken from Official Year-book of the Union of South Africa, No. 6, and re-calculated to 1897-1898 as base. These data are only for six cities and therefore not altogether comparable with the later periods since 1910.

(2) Data for the period 1914 to 1924 taken from New Retail Price Index Numbers, 1938, Special Report No. 127, Office of Census and Statistics, Pretoria, and re-calculated from 1938 as base to 1914 as base. These data are for nine towns.

(3) Data for the period 1938 to 1947 obtained from the Office of Census and Statistics, Pretoria.

(4) Average for first quarter of 1947.

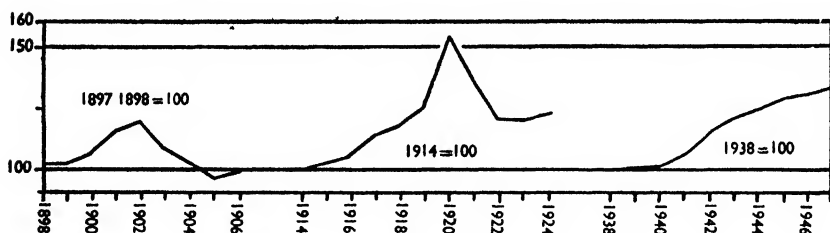


FIG. 3.—Index numbers of retail prices for food, fuel, light and rent during three war periods in South Africa. (See Table III.)

The retail price index shown in Figure 3 increased strongly during the war periods, just as happened in the case of the series shown in Figures 1 and 2, although it did not undergo the same relative increases as either the agricultural price index or the wholesale price index of all commodities. During the Anglo-Boer War period the retail price index as well as the food price index increased much less than during the First and Second World War periods. Various reasons can be given for this difference in the relative increase between the first war period and the later two war periods, but these are irrelevant in this case.

The retail price index as well as the food price index declined after the Anglo-Boer War to, and even much below, the pre-war average. In the case of World War I both these series declined sharply within two years after reaching the peak, but did not decline to the pre-war average. Even during the worst of the depression in the early thirties the retail price index did not decline to the pre-war average again.

PRICES THROUGH THREE WAR PERIODS.

TABLE IV.—*Index numbers of retail prices of food in South Africa during three war periods.*

Anglo-Boer War ⁽¹⁾ . (1897-1898 = 100.)		World War I ⁽²⁾ . (1914 = 100.)		World War II ⁽³⁾ . (1938 = 100.)	
Year.	Index.	Year.	Index.	Year.	Index.
1898	101	1914	100	1938	100
1899	102	1915	107	1939	99
1900	102	1916	111	1940	103
1901	112	1917	124	1941	110
1902	111	1918	125	1942	121
1903	104	1919	136	1943	132
1904	97	1920	178	1944	137
1905	94	1921	145	1945	141
1906	89	1922	119	1946	144
1907	88	1923	117	1947	149 ⁽⁴⁾
1908	88	1924	120	April 1947	153

- (1) For the period 1898 to 1908 data were taken from the Official Year-book of the Union of South Africa, No 6, and converted to 1897-1898 as base. These data apply to only six cities and are therefore not altogether comparable with the later periods subsequent to 1910.
- (2) For the period 1914 to 1924 data were taken from New Retail Price Index Numbers, 1938, Special Report No. 127, Office of Census and Statistics, Pretoria, and converted to 1914 as base.
- (3) For the period 1938 to 1947 data were obtained from the Office of Census and Statistics, Pretoria.
- (4) Average for first quarter of 1947.

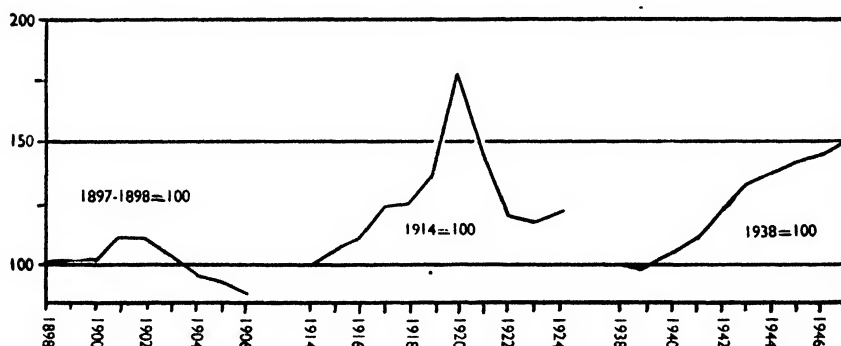


FIG. 4.—Index numbers of retail prices for food during three war periods in South Africa. (See Table IV.)

During the recent war period both the retail price index and the food price index did not undergo the same percentage increase as during the period of World War I. With 1938 as base, the retail price index used in Figure 3 increased to 136 in April 1947, and the food price index to 153. In 1920 and with 1914 as base, these two series reached their peaks of 155 and 178 respectively. The increase in the retail price index since 1938 to April 1947 is, however, considerably more than the increase since 1914 to 1919, the year prior to the peak during that period. The same applies to the increase in the food price index up to the present compared with the increase up to 1919. (Compare data in Tables III and IV.)

The above comparisons of increases in retail prices during the two war periods rest on separate bases, e.g. 1914 as base for the increase in the years following, and 1938 as base for the increase to the present. If the same base is used for both periods, the present level can be compared with the level in the period of World War I.

It has been shown above that the retail price index (Figure 3 and Table III) with 1914 as base, increased to 126 in 1919 and to the peak of 155 in 1920. If the index with 1938 as base is converted to 1914 as base, it stands at 151 in 1946 and 156 in April 1947. Taking 1938 as base for both periods we find the retail price index at 131 for 1946 and 136.4 in April 1947, in comparison with 135.5 for the average of the peak year 1920.

With 1914 as base the food price index increased to 136 in 1919 and to the peak of 178 for the year 1920. On the same base this index increased to 155 in 1946 and 165 in April 1947. Or, on the 1938 base, the food price index stood at 144 in 1946 and 153 in April 1947, in comparison with the peak of 166 in 1920. Thus, as the retail price index for food, fuel, light and rent has already reached the same level as at the peak in 1920, the food price index is still well below the level of 1920. The application of price control measures, coupled with a certain amount of subsidization, contributed much toward retarding the increase in food prices during the recent war period. Had it not been for these two factors, food prices would already have been much higher.

The cost of living level at any point of time is not necessarily a reflection of its pressure on the population as a whole or on the individual as such. The pressure of the cost of living depends on its relationship to the total income of the population or the income (i.e. wage, salary, etc.) of the individual. The severity of the pressure also depends on whether the cost of living is high for a relatively long or a relatively short period.

Rate of Price Increases.

In any comparison of price trends during different periods, it is necessary to compare not only the peaks or low points but also the rate of increase or decrease, in order to obtain a better picture of their effect on the different population groups, whether producers or consumers.

In the case of agricultural prices it has been shown that on a uniform base the present level is approximately the same as the peak of the First World War period, i.e. the average for the year 1919-20. The increase during the First World War was, however, not continuously as sharp as during the past few years. (Compare again the trends during the two periods in Figure 1.) The great increase occurred only in 1919-20, and was followed by a decline in the next year to a lower level, which was, however, still fairly high. During the period of World War I, agricultural prices were therefore very high for only two years at the most. The average agricultural price index during the years 1941-42 to 1945-46 was 170 in comparison with 160 for the five years 1916-17 to 1920-21, a difference of 10 index points. The difference would be much greater if the index for 1946-47 (*) had also been included in the calculation. During the past few years producers have therefore

* The index for the full twelve months is not yet available.

PRICES THROUGH THREE WAR PERIODS.

experienced a longer "high-price" period than during the period of the First World War.

More or less the same position is found in connection with the two indexes of retail prices. During the period of World War I retail food prices were, for example, exceedingly high only in 1920. Only in that particular year were food prices higher than they have been since 1944 to date. (These comparisons are not to be inferred from the figures in Table IV.)

A similar position is found in studying the combined index of food, fuel, light and rent. Only during 1920 was this index higher than the level since 1943 to date, whereas in the rest of the period of World War I it was lower.

As a result of the difference in the rate of increase in both agricultural and retail prices during the two war periods, the accumulative effect which both these sets of prices had on producers and consumers respectively differed during the two periods.

Future Level.

The question is so often put as to when the cost of living will decline. This is impossible to forecast because the economist is no prophet. Many people are of the opinion that the Government can at a single stroke decrease prices to the pre-war level. This is absolutely impossible. An intricate network of economic factors is responsible for the present level of prices and it is impossible to undo this network immediately.

The present price level cannot, however, maintain itself indefinitely. A decline must set in sooner or later. Should a decline in the general price structure set in, it can be expected that agricultural prices and the prices of other raw materials will decline faster and further than the general wholesale price index, and especially further than retail prices.

It is definitely doubtful whether the retail price index will decline again to its pre-war level, i.e. the level at approximately 1938 and 1939. After the First World War (with 1914 as base) the retail price index of food, fuel, light and rent declined from 155 in 1920 to 121 in 1922. During the twenties it fluctuated around the 120 level. The average index for the eight years 1922 to 1929 was 122. It did not return to the pre-war level. Even in 1933, during the worst depression which the country has ever experienced, this index did not decline below 108. A return of retail prices during the following few years to the pre-war average seems highly improbable.

Between the price received by the producer, whether farmer or manufacturer, and the price paid by the consumer, i.e. the retail price, there is a whole series of services rendered and consequently costs involved. Many of these costs have meanwhile increased to a higher level and cannot easily be reduced. Wages are one important part of these costs between producer and consumer, and wages are more easily moved upward than downward. The consumer also demands more and better services, factors which therefore all make for a larger margin in the distribution process. In comparison with the pre-war cost level a relatively high cost structure can therefore be expected for a very long time. Greater efficiency in the whole distribution network can, of course, have a declining effect on distribution costs and therefore on retail prices.

Summary.

The purpose of the above analysis has been to compare the trends of agricultural prices, wholesale prices of all products and retail prices during three war periods in South Africa and to determine certain basic differences.

During all three war periods each of the price series underwent large increases. In each case the peak was reached after the cessation of hostilities. In the case of the first two war periods the peaks were followed by drastic price declines.

The relative increase in agricultural prices with each separate pre-war year as base was greater since 1938-39 to date than since 1913-14 to 1919-20. Agricultural prices were, however, slightly lower in 1938-39 than in 1913-14. On one base for both periods the agricultural price index at present is on the same level as the peak in 1919-20.

Agricultural prices are to some extent high, compared with the general wholesale price index. Sooner or later a return of agricultural prices to a level at least in relation with the wholesale price index should take place. Any group of prices cannot for long be out of line with the general price level.

The index numbers of retail prices have not undergone the same percentage increase since 1938 to date as during the First World War period, i.e. from 1914 to 1920. Retail prices were, however, on a somewhat higher level in 1938 than in 1914. If one comparative base is used throughout, the retail price index of food, fuel, light and rent is at present practically as high as the average for the peak year 1920. On a comparable base the retail price index of food in April 1947 was, however, still much below the peak in 1920. Effective control of food prices, coupled with subsidization of basic foodstuffs, retarded the increase in food prices during the recent war period.

After World War I, the retail price index of food, fuel, light and rent did not return to the pre-war level. This index fluctuated for many years around the 120 level. Due to various factors it is improbable that the cost of living will return to the level of just before the recent war.

Increased Food Production Through Fertilization:—

[Continued from page 560.]

Even under the present conditions of fertilizer shortages and with due consideration of the fact that the price of practically all the principal fertilizers has been doubled since the beginning of the war, the farmer can still, by judicious planning, help to make full use of the available supplies. By more effective methods of production, the conditions giving rise to complaints and criticism from townspeople in connection with subsidies, high prices and the shortage of agricultural products, may be eliminated to a certain extent if the producer does everything in his power to bring down his production costs under the present difficult post-war conditions.

(Dr. E. R. Orchard, Division of Chemical Services.)

The Horse on the Farm.

VII.—Saddlery, Harness and Hitches.

Dr. P. J. v. d. H. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

TO-DAY the riding equipment on many farms consists only too often of some ancient saddle, as like as not with a broken tree, and a bridle mended in various places with wire. This, more than anything else, is indicative of the low position to which the riding horse has fallen in the scheme of farming operations and in the affection of the farmer; for what man who takes a pride in his horses would furnish them with such inferior equipment? Even when the state of affairs is not as bad as that described, many a good horse is spoilt in appearance by being turned out in cheap, clumsy or gaudy saddlery. The object of this article is to give some information on proper saddlery.

The Bridle.

The simpler the bridle, the better. A good horse needs no such artificial aids as coloured browbands, brass rosettes or studded cheek pieces to add to its beauty, and among knowledgeable horsemen such cheap adornments are regarded as being in very poor taste. A neat fit and good quality leather are what the horseman looks for.



FIG. 1.—An American lass on a U.S.A. Saddler.

Now, if you are a rich man or have only one horse and you want your bridle to look very neat, have the reins sewn on to the bit, likewise the cheek pieces. This does away with all buckles except those needed to adjust the cheek pieces, but as one may for

various reasons wish to hang the bit in a different position in one's horse's mouth, it is as well to have buckles on the cheek pieces so that these adjustments may be made. However, not all of us are wealthy enough to afford a separate bridle for each of our horses, and must therefore fall back on the usual type of adjustable bridle, so that we may change it from one horse to the other. In selecting a bridle, see that it is neatly made of good leather, and that the buckles are not large and clumsy.

A plain leather noseband with separate cheek pieces running through the loops of the browband and over the poll-piece will add to the appearance of a well turned out horse, and is, of course, a necessity where a standing martingale is used. The noseband should not be too narrow— $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. is a suitable breadth—and should be adjusted to hang about an inch below the prominent bones on either side of the horse's face.



FIG. 2.—Member of a Capetown riding club on a Thoroughbred.

It will depend on the rider's choice whether he uses one or two reins. Two reins are better in a show ring, but men on farms who spend long hours in the saddle generally do not want to be bothered with more than one rein. They do not ride "at attention" as is expected of show riders, and one rein is quite sufficient for their purpose. But whether one or two reins are used, the leather should be supple and of good quality and not too narrow. Half an inch is an adequate breadth. Some reins are buckled at the middle; others are sewn together. In general one recommends sewn reins for show riding, and buckled reins for veld work, because a horse sometimes gets "hung up in the reins" in the veld when hitched to a tree or left to graze, and it is useful to be able to unbuckle them in the centre.

THE HORSE ON THE FARM.

The nature of the bit will vary with each horse. It is a barbarous procedure to ride a horse in a severe bit if it will go well in a mild one. Factors that make a bit severe are: A thin mouth-piece, a high port, a long shank between mouth-piece and curb rein and between mouth-piece and the attachment of the cheek-piece.



FIG. 3.—A properly fitting bridle and standing martingale. Note the absence of superfluous buckles, and the breadth and position of the noseband.

The best bits are made of steel because of its great strength, but as steel rusts, it needs constant burnishing. Not everyone can

afford the time or servants to keep steel bits clean, and consequently non-rusting nickel bits have become popular. They are much inferior to steel in strength.

The Curb Chain.

The curb chain should consist of broad links, which should be twisted until they are flat before being attached to the hook. Two fingerbreadths between the chin and curb chain when the bit is hanging normally in the horse's mouth, is the usual space allowed, but this will vary with different horses.

Martingales should not be worn unless necessary. It is a mistake to show a hack in a martingale. A hack is supposed to be sufficiently well-mouthed to need no artificial aid to keep its head in the right position, and the presence of a martingale implies that it is not so trained. Of course, a standing martingale is necessary on a polo pony. It should have a sewn loop through which the noseband passes, and an adjustable, buckled loop through which the girth passes between the forelegs. It is a mistake to have sewn loops at either end and an adjusting buckle some distance below the noseband, in other words, to have the martingale in two pieces, as the tongue of the adjusting buckle soon cuts through the leather.

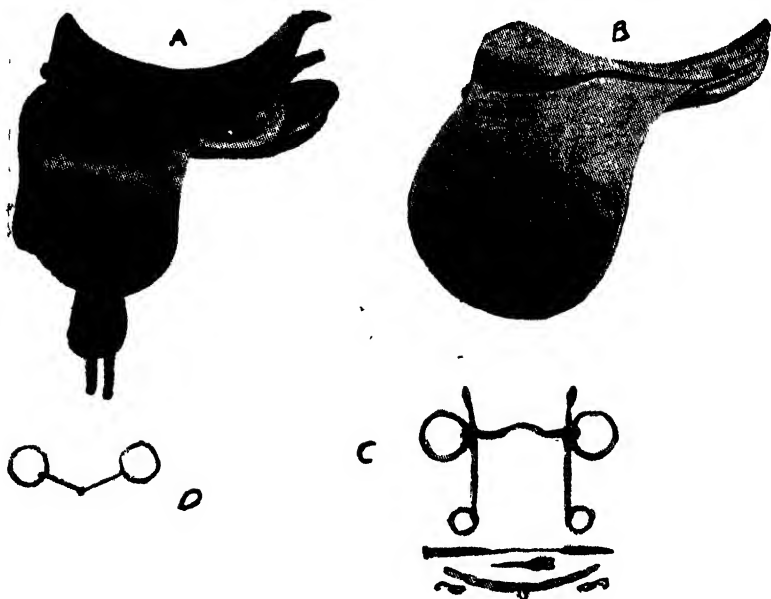


FIG. 4.—A. British military saddle. B. English hunting saddle. C. Pelham bit, lip strap and curb chain. D. Snaffle

Saddles.

As regards saddles, it should be realized that there are many and varied patterns, and that the type of saddle one uses greatly influences one's seat. For example, one cannot ride with a "forward" seat in a Western American stock saddle which is built for a straight-legged seat. The so-called colonial saddles are built to enable the rider to ride with a comparatively long leather, because that is an easy type of seat for men who spend long hours in the saddle, and among colonial peoples the trot as a riding pace is not much in vogue. In Europe and in countries where European

influence prevails, the trot is an important gait and the rider rides with shorter leathers to enable him to post at the trot. Nor does he need such aids as high pommels and cantles, or thigh and knee rolls to help him to maintain his seat, as he rides comparatively quiet horses. The seat of the European type of saddle is therefore more or less flat, and the saddle is reduced to the limit of plainness consistent with comfort. The flaps are cut either comparatively straight or forward, in accordance with the length of stirrup favoured by the rider.

It is necessary to give some attention to the military saddle, as many thousands of these have found their way on to the market as surplus war stock. This is a strong, serviceable saddle without any stuffed panels. The wooden side bar is covered with a numnah panel and yet another numnah or saddle blanket is interposed between the saddle and the horse's back. The latter is preferable since it can be folded in different ways to give a greater or lesser cushioning effect as is required by the muscling of the horse's back. Unless care is exercised in fitting the saddle, it will often cause

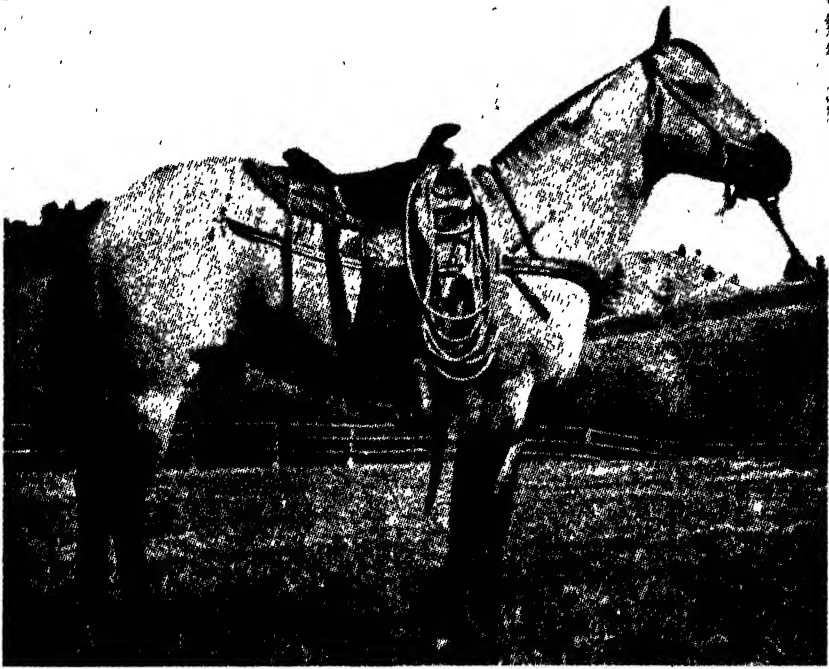


FIG. 5.—Buckskin Joe, with cowboy outfit.

galls because of the absence of stuffed panels and consequent lack of padding. Furthermore, the sidebars project beyond the front arch of the saddle, and these projections (the burrs) often press against the shoulder blade, interfering with its play and causing a nasty gall.

The military saddle blanket measures approximately 5ft. 9in. in length and 4 ft. 10 in. in breadth. The blanket is first folded in its length and then in its breadth. This gives two folded and two raw edges. The folded edges are placed to the front and off side of the saddle. Care must be taken to lift the blanket well into the channel of the saddle so that there is no pressure on the withers

and spine. The blanket must also not be allowed to wrinkle under the saddle. If more than four folds of blanket are required under the saddle, the blanket can be folded in three layers across the back and the ends then turned up under the side bars. It is not desirable to carry the ends of the blanket well up into the channel of the saddle as this may cause pressure on the spine and prevent the free circulation of air. When this arrangement is likely to be permanent, the folds of the blanket can be kept in place by a few stitches.

Riders should be careful to use the type of saddle best fitted for the work in hand. Thus a heavy stock saddle would be entirely out of place in a hack class at a show, the only saddle permissible in this instance being a hunting saddle. This in turn would be of little use to a man undertaking a journey and having to carry a certain amount of equipment with him. Here a larger, heavier saddle with the necessary D's for the attachment of kit would be necessary.

A well made saddle is an expensive article, but it is well worth buying in preference to something cheap, not only because of the additional comfort it will give both mount and man, but also because of the very long life that can be expected of it.

New saddlery may be treated with neatsfoot oil (applied with a flannel cloth) as this softens and preserves the leather. It is a mistake, however, to soak articles of saddlery in neatsfoot oil as this will cause them to stretch and rot, and the oil continues to work out of the leather for a very long time, which, in the case of saddles, is of no advantage to the breeches. Saddlery should be regularly washed and polished with saddle soap. It should never be polished with boot polish. Riders in this country should be careful in their choice of saddlery as the market is flooded with much inferior material.

Stirrup irons, like bits, should be of steel for preference, but one may have to be content with nickel. They should be strongly made and give ample room to the foot, so that in the event of a fall the foot will slip out easily.

Girths are of many types and material. In the writers' opinion the folded leather girth is the best. The folding ensures a rounded edge which does not chafe, and the girth can be kept permanently soft by including between the folds a length of flannel soaked in neatsfoot oil. There are certain adventitious pieces of saddlery such as cruppers, breast-pieces and martingales, which must be dealt with. Mention has already been made of the standing martingale. Running martingales have a split leather strap carrying two rings at the end through which the curb reins pass. They give a certain amount of control over a horse that throws its head about. They should be so adjusted that, when the horse is standing at attention with its nose at the level of its withers, the martingale is just taut. One often sees horses at country shows with running martingales adjusted very short, so as to give additional leverage to the curb rein in order to get the animals to arch their necks (very often to overbend and bore into their chests). This procedure will speedily ruin any horse's mouth.

When running martingales are used, the bit reins should carry leather guards of about $\frac{3}{4}$ in. by $\frac{1}{2}$ in. between the rings of the martingale and the ring on the bit for the attachment of the curb reins, otherwise the former may work its way over the latter and become caught. As previously mentioned, there is no advantage in a horse appearing in a martingale if he will go equally well without one.

THE HORSE ON THE FARM.

Cruppers and breast-pieces should be used only in mountainous country where they save girthing the horse too tightly to prevent the saddle slipping backwards and forwards during the ascent and descent of steep slopes. They should never ordinarily form part of the rider's equipment.

Harness, Hitches and Vehicles.

Harness.

With slight adjustment, ordinary carriage harness can be used for draught horses. Where possible, collars are to be preferred to breast-plates, but then every precaution must be taken to see that they fit properly at the outset. A good collar should be 2 to 2½ inches longer than the depth of the horse's neck, while the width should leave enough space for the hand to be easily inserted between



FIG. 6.—A demonstration on harness and harnessing.

the collar and neck and windpipe. Each horse should have its own collar, since with use it shapes itself more to the horse's shoulders, thus giving a perfect fit. Most open collars are made too short or too narrow. The good collar when pushed back hard against the shoulders should leave enough space to insert the flat hand easily between collar and windpipe. If collars fit properly, no sweat pads or space pads need be inserted. The face of the collars must be kept clean and smooth by washing and not scraping. (The accompanying photos show a good set of harness for wheelers. Note the coupling to the beam and collar.)

Hames must fit collars correctly; if too short, the collar will be pulled out of shape. The hames must fit the rim of the collar closely at all points.

Traces must be fastened about one-third the way up on the shoulder and must be of equal length. Make sure that all parts of the harness—bridle, bit, throat latch, girths, etc.—fit comfortably.

If the bit is too low, it may get under the tongue; if too high, it may chafe the corners of the mouth. Any other undue tightness

or slackness in any other part of the harness will also cause discomfort or breakages.

Breast-plates are most commonly in use in South Africa. These need not be very broad for heavy horses— $3\frac{1}{2}$ inches will suffice—as a broad plate becomes too hot and “burning” results. A good smooth leather lining is preferable to pads of felt or discarded rubber tubing. If a team is rested at reasonable intervals and the harness completely slackened, all spots where pressure is greatest will cool off sufficiently to prevent “burning”.

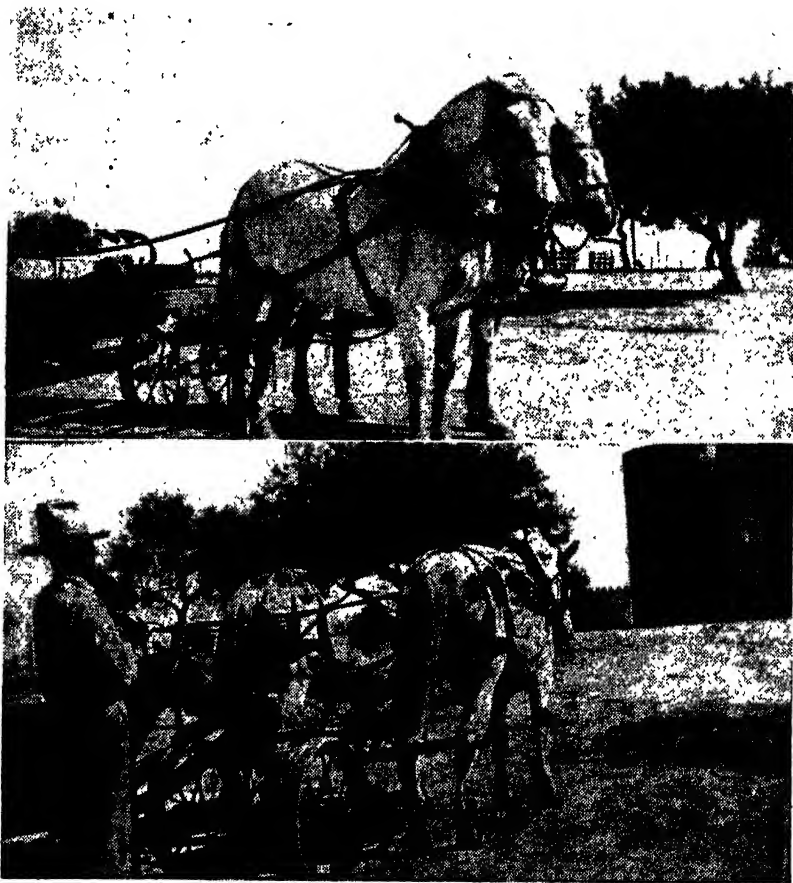


FIG. 7.—A good outfit—front and rear views.

Under continued hard work all collars and breast-plates should be properly cleaned each evening with warm water and a little soap before sweat and dirt dry hard on them. During the first spell of hard work it will be advisable to wash the shoulders and breast of horses every evening with a salt solution. Keep the manes from under the collar when the horse is at work. See to this frequently. The manes of geldings are often clipped—but this would spoil the looks of stallions and mares.

THE HORSE ON THE FARM.

To clean harness properly all the pieces are unbuckled and moistened (but not soaked for more than fifteen minutes) in luke-warm water into which a piece of mild soap has been dissolved.

Each strap or piece is then carefully scrubbed and thoroughly rinsed. By the time all the parts have been scrubbed, those cleaned at the beginning will be fairly dry, and, while still slightly damp, are then oiled with any reputable preparation of which the main ingredient is neatsfoot oil. Good tallow made into a buttery paste with neatsfoot oil also gives good results. A good harness oil can also be made on the farm by melting 2 lb. beeswax and 5 lb. of beef tallow mixed with one gallon of pure neatsfoot oil.

After this process the harness is hung in a dry place—not in the sun or near a fire—and, when the oil has soaked in, the various parts can be rubbed well with a lather of soft-soap to remove surplus grease or any greasy appearance. Such a cleansing and polishing treatment administered to all harness twice a year will not only keep the harness pliable and clean, but will prolong its life very considerably.

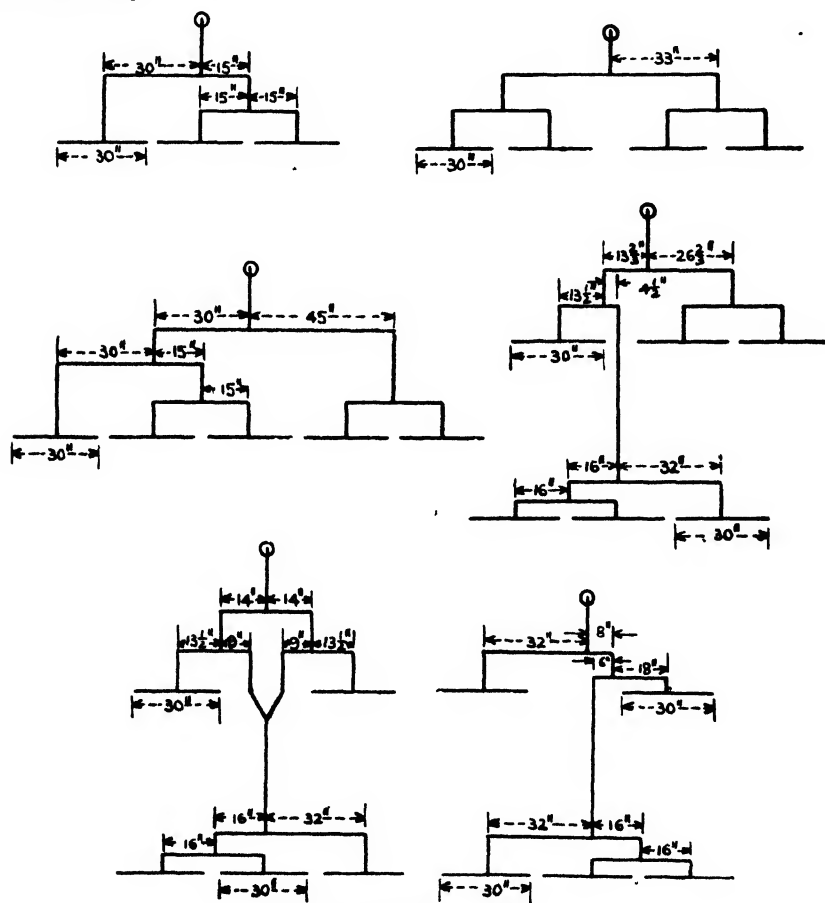


FIG. 8.—Different hitches.

When harness is not in use, it should be hung in a dry harness room. Collars should hang on a peg with the name or number of the horse to which it belongs. Sweat and dirt should be removed with a damp cloth before harness or collars are stored.

Every farmer or user of horses should possess a repair kit, the main equipment of which consists of a pair of pliers, several awls, an assortment of needles, several balls of good thread or riempies, a cake of wax, a wooden clamp (preferably attached to a stool), several pieces of leather, snaps, buckles, and possibly also edging tools and creasers for repairing saddles.

Harness should always be kept in good repair. Any idle spell, apart from routine attention, should be devoted to a good overhaul and thorough cleaning and mending of the harness. Well cared for harness will last a remarkably long time and must add to the success of the general farming operations.

The Cape Province is famed for its good "riempie"-sewn white leather harness—a product equal to the best from anywhere else. Such harness, if made by reputable firms and well cared for, lasts for many years. Careful measurements should be made of the average type of heavier horse used, so that comfort and fits may be assured.

Multiple Hitches.

Fewer horses can pull a given load when they are used in abreast hitches. The main advantages of the multiple hitch are:—

- (1) It eliminates side-draught, thus increasing the power by approximately 15 per cent.
- (2) It enables one man to accomplish more work per day.
- (3) It equalizes the pull of the horses.
- (4) It prevents crowding and enables horses to keep cooler.
- (5) It assures a straight pull from the plough or implement, and prevents sore shoulders, necks, legs and sides.
- (6) It is well suited to large horses, for it allows room and freedom for them to work without crowding, and is equally well suited to smaller horses, for more can be used in a team and make up for the lack of strength in each horse.

Multiple hitches of three, four, five and six horses are much in vogue in different parts of the world where horses are the main source of tractive power for farm work. The kinds of multiple hitch sometimes used in South Africa are the four-horse hitch for harrowing rough ploughed lands, and a five-horse hitch for harvesting. Sometimes only three good horses are hitched and at other times five may be used, depending on the size and weight of the horses, weight of the harrows and the type of land and work. The accompanying sketches (Fig. 8) indicate the position of the eveners (swingles). The inside horse or horses are coupled to the outside pair for which only one pair of reins is necessary.

There is a definite saving of horse power and labour in using horses in a multiple hitch. The horses are closer to the load and are handled more easily. A three-hitch team abreast can do more per day than a four-horse tandem team. The three can exert more power and gain time at the turns.

The three-horse swingle can be used on a single-furrow plough, the off side horse walking in the furrow and the other two on hard ground. The four- and five-horse swingles are suitable for harrows, disc and other cultivators, wheat drills, rollers, harvesters, etc., and the farmer using them will quickly see their advantage.

THE HORSE ON THE FARM.

When draught horses are worked abreast, the draught must be evened; this is done by equalizing or compensating swingles as shown in the accompanying sketches. The horses can be coupled one to the other, only two outside reins being necessary. If it is desired, however, reins can be adjusted for three horses so that they steer in the same way as two. To do this, take an ordinary pair of double reins, sew a buckle on each running rein about 6 to 9 inches behind the check-rein buckle, and attach a rein (on both the off and near side rein) a little longer than the check rein (inside rein). The off side running rein fastens on the outside of the off horse, and the check rein on the off side of the middle horse; the additional rein goes across the back of the centre horse and fastens on the off side of the near horse; the near side running rein fastens on the near side of the near horse, and the check rein on the near side of the centre horse; the attached rein passes across the centre horse's back and fastens on the near side of the off horse. The attached reins can be passed through a loose ring above the centre horse's back.



FIG. 9.—Stud mares in double shaft and tandem.

The inspanning of five horses in a wagon, trolley or coach is common in Australia, where they are yoked two at the wheel and three in the lead, and the reins adjusted as above. This five-horse team pulls a load as easily as six horses inspanned two abreast tandem, as all the horses are nearer to the pull, and the reins can be easily adjusted so that each horse is absolutely under the control of the driver.

Vehicles.

In using draught horses for heavy hauling, the greatest advantage is obtained in lightening the vehicle as much as possible. In pre-rubber days, wagon builders supplied vehicles with ball-bearing wheels; but with the introduction of the pneumatic tyre users of horses were not slow in fitting the new type of wheel to all kinds

of horse-drawn vehicles. With the correct type of wheel, loads can be more than doubled for the same horse power in comparison with vehicles equipped with iron tyres. Additional advantages of pneumatic tyres are that an increased load capacity is assured owing to lighter construction and a smaller amount of "dead" load; the life of the vehicle is prolonged considerably; and the damage to road surfaces is greatly reduced. Apart from these economic advantages there is less noise and a smoother transit in city streets. Almost any vehicle can be equipped with suitable pneumatic tyred wheels, but certain firms build suitable wagons and carts for different types of transportation. Even the donkey-drawn rural school cart is not forgotten.

The main considerations in the construction of such vehicles are that the framework should be light but strong, and the type of pneumatic tyred wheel fitted should suit the load which the vehicle is to carry and the road on which it is to work.



FIG. 10.—Stallion in double shaft and collar.

In pre-motor days a large assortment of vehicles was used:—hansom cabs, Cape carts, spiders, wagonettes and larger horse wagons. The horse-wagon is still common on the larger grain farms of the Cape, while the 8-horse or 8-mule teams of the Cape are national institutions.

On the more intensive farms, the lighter but strong pneumatic tyred wagon for two or four heavier draught horses is more common. A very useful vehicle on almost all farms is a light pneumatic tyred wagon, with changeable single and double shafts. In double shafts the stud stallion or mare can draw all the lighter loads about the farm, while for heavier loads the single shaft can be fitted for a pair. This outfit is more economical and practical than a lorry, and is to be preferred to the large scotch-cart which, with two wheels and a heavy load on indifferent or wet farm roads, is rather severe on one horse, especially a pregnant mare.

Wastage in a Valuable Industry.

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Agricultural Education and Research.

FIGURES available up to the present indicate that the value of the Union's production of hides and skins during 1946 exceeded £6,000,000.

Due to regulations promulgated under the War Measures Act, a certain amount of improvement was effected during the war years in the curing of hides derived from abattoirs. Although the curing of *skins* was not regulated, improvement in their curing is also taking place due to the propaganda work undertaken by the Inspectors of the Department of Agriculture appointed to see that the regulations governing the curing of hides are carried out at the various abattoirs and by the curers.

It is gratifying to note that farmers in general are becoming more hide-and-skin conscious than they formerly were, but there still remains considerable room for improvement before any appreciable reduction in the wastage in hides and skins will be perceptible.

The tables given below indicate the weight (in lb.) of the main types, classes and grades of hides and skins exported from the Union during the calendar year 1946. The figures have been collated from the monthly reports submitted by the Hide and Skin Inspectors at the various ports. As 1946 was the first year in which such detailed records have been kept, it is not possible to compare these figures with those of previous years.

Hides and Skins Exported During 1946.

TABLE I.—*Merinos*.

Class.	Sound. (a)	Secondary. (b)	Damaged. (c)	Sound.
	lb.	lb.	lb.	%
Super combing.....	1,532,064	—	611,403	71·5
Combing.....	2,197,708	—	1,326,976	62·4
Long.....	1,502,573	—	1,520,635	49·7
Medium.....	1,018,519	—	1,420,031	41·8
Short.....	955,572	—	1,520,147	38·9
Pelts.....	668,238	—	482,639	58·1
Long Lambs.....	1,817	—	6,209	22·6
TOTALS.....	7,876,491	—	6,870,040	53·4
TOTAL (a) and (c).....	14,746,531	—	—	—
Shearlings.....	11,999,018	2,143,192	—	84·8
TOTAL Shearlings (a) and (b)	14,142,210	—	—	—

Merinos constitute the largest number and greatest weight of skins exported. It will, however, be noted that, of the total weight of Merinos exported, only 53·4 per cent. was sound, whereas 46·6 per cent. was damaged. The major portion of the damage is preventable as reports indicate that only a small percentage of skins was classed as damaged owing to drought. Even here proper provision of reserve food supplies would have reduced even this small percentage.

The main causes of damage in Merinos are knife marks and cuts, faulty and uneven curing, skin beetles and moths.

Shearlings are also merino skins, but are classified separately as they are used for a different purpose from other classes of Merino. "Merinos" are de-woolled, whereas shearlings are used with the wool on the pelt for the manufacture of coatings, imitation furs, etc. In shearlings it is of primary importance that the pelt should be sound and of good shape. The shape of the pelt depends on how the skin was "opened up" or "ripped" when flaying was commenced. Skins with wool over 2 inches in length (e.g. combing) are not usually put with shearlings.

There are no damaged shearlings as these would be classified as "Merino" type.

TABLE II.—*Coarse and Coloured Crossbred* :—

Class.	Sound. (a)	Damaged. (b)	Sound.
	lb.	lb.	%
C. and C.	202,851	47,982	80·9
X-Bred.	334,053	77,139	81·2
TOTAL	536,904	125,121	81·1
TOTAL (a) and (b)	662,025	—	—

These figures would indicate that the proportion of Sound to Damaged was relatively high. In actual fact this does not reflect the true position, as the export of C & C and X-Bred skins is prohibited except under permit, and no exports have taken place since July 1946. The output of these skins is reserved for use by local tanners for the manufacture of lining leathers, of which there is a great scarcity, particularly since the imposition of sanctions by the Government of India. Local tanners do not, however, use damaged C & C and X-Bred skins to any large extent. As a result there has been an accumulation at the ports of these damaged skins, which, if exported, would have considerably reduced the percentage of sound skins.

The value of C & C and X-Bred skins lies primarily in the pelt rather than in the wool that is on it. On this account good shape, careful flaying and proper curing are of great importance.

TABLE III.—*Gloving Skins* :—

Class.	Sound.	Secondary.	Damaged.	Sound.
	lb.	lb.	lb.	%
Large W.P.	2,795,189	502,717	—	84·8
Medium W.P.	479,526	167,482	—	74·1
Large Woolly.	1,370,694	150,913	—	90·1
Medium Woolly.	153,873	28,506	—	84·4
Large Persian	947,975	87,944	—	91·5
Medium Persian	268,966	50,444	—	84·2
Light Medium	101,445	34,195	—	74·8
Lamb	25,324	7,274	—	77·7
All Classes	—	—	312,783	—
TOTALS	6,142,992	1,029,475	312,783	82·1

WASTAGE IN A VALUABLE INDUSTRY.

The export regulations make provision for three main classes of gloving skins, viz. Western Province (W.P.), Woolly and Persian types. Good South African gloving skins are considered amongst the best in the world for the production of gloving leathers. Unfortunately too few really good skins are produced owing to some or other preventable blemish, with the result that the whole production is prone to be graded down. In Table III, 82·1 per cent. of gloving skins are shown as sound, but they are not as good as they could be with better treatment and care.

Out of the total of 7,485,250 lb. gloving skins exported, 13·8 per cent. were Secondary and 4·1 per cent. Damaged. As the sole value of these skins lies in their potential leather value, the treatment of the pelt is of the utmost importance. To ensure a good spready skin, good ripping is necessary, together with proper curing, including the careful removal of adhering fat, which, if not removed, will cause a stain on the skin next to it in the pile.

The skins are frequently spoilt by knife marks and cuts, bad shape, faulty curing, fat stains, beetle and moth damage, steekgras and paperiness due to poor nutrition.

TABLE IV.—Goats.

Class.	Sound.	Secondary.	Damaged.	Sound.
	lb.	lb.	lb.	%
Extra Light D.S.*.....	478,842	226,837	—	67·9
Light D.S.*.....	707,544	193,569	—	78·5
Medium D.S.....	561,106	64,168	—	89·7
Heavy D.S.....	255,747	30,297	—	89·4
Kid D.S.....	22,347	17,772	—	55·7
Bastard D.S.....	42,352	9,216	—	82·1
Extra Light S.D.†.....	9,670	11,736	—	45·2
All Classes.....	—	—	234,683	—
TOTALS.....	2,077,608	553,595	234,683	72·3
Angora.....	346,865	37,601	31,695	90·2

Total goat skins exported (excluding Angora)..... 2,874,886 lb.

Total Angora skins exported..... 416,161 lb.

*D.S. Drysalted. †S.D. Sundried.

As with gloving skins, the sole value of goat skins (other than Angora) lies in the pelt.

It will be observed from Table IV that only 72·3 per cent. of the total goat skins exported were graded as Sound, while 19·2 per cent. and 8·5 per cent. were Secondary and Damaged, respectively. In other words, almost 30 per cent. of goat skins had sufficient blemishes to be graded down. Blemishes found in goat skins are similar to those in gloving skins, including cracks in the grain (hair side) surface of the skin due to folding.

The export figures given in Table IV represent about two-thirds of the Union's 1946 production of goat skins, as one-third is used by local tanners and sold to them at controlled prices.

Of a total of almost 10,000,000 lb. of drysalted and sundried hides exported during 1946, only 21·6 per cent. were classified as Firsts. Even in Firsts certain blemishes are allowed, viz. one brand mark and one defect on the hide other than on the butt.

Firsts from other countries are free of brands and defects. A normal size brand on the butt reduces the value of a hide by at least 3s. 6d., and many hides have more than one brand mark. The wastage in hides is colossal, due to bad ripping, bad flaying, faulty curing including sun-baking, horn marks, barb-wire scratches, whiplash marks, tick marks, beetle and moth damage, and cracked grain due to incorrect or over-folding. (Hides should be folded once only, down the line of the backbone with hair side inside to protect the grain surface.)

TABLE V.—*Hides.*

	First.		Second.		Third.		Fourth.		Total.
	lb.	%	lb.	%	lb.	%	lb.	%	lb.
(i) <i>Dry-salted.</i>									
10/20 lb.	281,153	22.1	214,269	16.8	535,731	42.0	243,057	19.1	1,274,210
20/30 lb.	486,219	29.3	246,232	14.8	676,114	40.8	249,778	15.1	1,658,343
30 up...	—	—	—	—	42,363	95.9	1,786	4.1	44,149
Kip....	136,786	41.4	86,480	26.2	80,987	24.5	26,111	7.4	330,364
Calf....	144,618	38.7	100,758	27.0	94,431	25.3	33,536	9.0	373,343
TOTALS.	1,048,776	28.5	647,739	17.6	1,429,626	38.8	554,268	15.1	3,680,409
(ii) <i>Sun-dried.</i>									
10/15 lb.	262,815	17.5	332,363	22.2	524,971	35.1	377,993	25.2	1,498,142
15/25 lb.	766,878	18.1	743,226	17.5	1,534,910	36.3	1,188,044	28.1	4,233,658
Kip....	51,152	12.5	72,740	17.8	150,977	37.1	132,930	32.6	407,799
Calf....	19,924	15.6	24,297	19.0	44,447	34.8	39,199	30.6	127,867
TOTALS..	1,100,769	17.6	1,172,626	18.7	2,255,305	36.0	1,738,766	27.7	6,267,466
TOTALS (i) and (ii).....	2,149,545	21.6	1,820,365	18.3	3,684,931	37.0	2,293,034	23.1	9,947,875

Note.—The % shown after each weight indicates the percentage within the weight grade.

General.

It may not be generally known that a levy is imposed on all hides and skins exported, and that certain of the local tanners pay a voluntary levy on hides used locally. The funds so derived are administered by the Hide and Skin Advisory Board on which are representatives nominated by farmers, tanners, shippers, brokers and curers. This Board was created primarily to bring about improvement in the hide and skin industry. Certain improvements have been effected, mostly from the shipping end, but from evidence available it would appear that only a few farmers have responded to any appeals for improvement that have been directed to them from time to time.

The only area in which a definite improvement is noticeable is the Transkei, where, due to representations made by the Hide and Skin Advisory Board, a Hide and Skin Inspector is stationed who is doing excellent work among the traders.

Any persons who wish to improve the quality of their hides and skins should contact their Regional Office of the Division of Soil Conservation and Extension for particulars.

Temporary Cribs for Storing Mealies on the Cob.

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THE following information is submitted at the request of the Mealie Industry Control Board to assist farmers in building temporary cribs for the forthcoming crop. It should be stressed that although there are many different kinds of ventilated and unventilated cribs, of both permanent and temporary construction, the information given here confines itself to the design of simple, temporary unventilated cribs which can be built in time for the 1947 season from such materials as may be obtained by farmers at the present difficult time.

If, in due course, the principle of storing maize on the cob becomes a permanent feature of our industry, the temporary cribs will no doubt be superseded by more elaborate and permanent designs.

Although a certain amount of drying occurs in the cribs, it cannot be too strongly emphasized that mealies should only be placed in cribs when the moisture content is below about 20 per cent. The rate of drying of mealies in cribs is very much slower than when the cobs are on the stalks in the fields or when the ears are hung up where they are fully exposed to the wind.

Finally, the mealies should be husked clean before cribbing as the presence of husks and silk very seriously interferes with air movement through the crib, and consequent drying.

The cribs should be erected in the open where they are not shielded from the wind by buildings or trees. A suitable size would seem to be about 9 feet wide, 9 feet high and 44 feet long, as indicated in Drawing No. 1. Drawing No. 4 shows a pictorial view of the crib.

This crib would hold the equivalent of approximately 30 tons of shelled mealies. The wagons can be drawn up alongside and the maize dumped into the cribs through the 2' 6" gap under the high side of the roof; and maize can be removed through the end, stable-type door shown in Drawing No. 2.

The crib should be erected with the specific purpose of allowing the maximum circulation of air through the maize, and should be built with the sides facing the direction of prevailing winds. The roof should be rain-proof, but the walls and floors should be of the most "open" construction possible, consistent with retaining the product in the crib.

Good Ventilation Essential.

The dimensions of the crib have been chosen so that exactly one 50-yard roll of 6-foot and one roll of 3-foot wire netting will be used per crib. The crib does not necessarily have to be made this size, but the maximum width must in no case exceed 9 feet, as wider cribs would not permit of adequate air circulation. Nor should the indicated height be exceeded, as this would render loading from wagons more difficult, and furthermore the whole structure would also be less stable. If 4-inch diameter poles are used, these should be spaced

at 4-foot intervals, but thinner poles should be placed closer together. The required spacing can be calculated from the fact that the strength of poles varies as the cube of the diameter. For example, 3-inch poles should be spaced about 2 feet apart. The poles should be firmly fixed in the ground to a depth of about 2 feet, preferably with concrete, to prevent the crib from leaning or blowing over. As an additional precaution, the uprights should be firmly braced across as shown in Drawing No. 2.

The crib has been designed for the use of wire netting of 15-gauge $1\frac{1}{2}$ -inch mesh.

The use of thinner gauge wire is not recommended, but if used, the uprights and horizontal beams should be placed more closely together. Even with the suggested wire netting there will be appreciable bulging of the sides of loaded cribs.

The floor should be constructed as shown in Drawing No. 3. The 9-inch brick walls, two bricks high, running across the crib should be spaced at a clear distance of about 9 inches apart. This will allow of adequate ventilation through the bottom of the crib; and the gaps can easily be cleaned of debris which collects there during use.

During unloading of the crib, loose planks should be laid over the floor to take the load of wheelbarrows, or other traffic. If corrugated iron for the construction of the roof is unobtainable, the crib could be covered with wood or tarpaulins, as an emergency measure, or even left open, and only covered when rain is expected.

If wire netting is unobtainable, the crib could be lined with wooden strips or laths (off-cuts, paling, rustics) or even with mealie stalks, from which all leafy material has been removed.

As the latter materials would somewhat restrict air circulation through the crib, it is recommended that in such cases the width be restricted to a maximum of about 8 feet across.

In using mealie stalks, $1\frac{1}{2}$ -inch horizontal beams should be spaced at a maximum distance of 1 foot apart as shown in Drawing No. 6, and preferably closer. It is unlikely that the mealie-stalk walls would last more than one season. Whether wire netting, wooden laths or mealie stalks are used, these materials should be attached to the *inner* side of the vertical and horizontal supports. The laths or stalks should be spaced one inch or slightly less apart (as shown in Drawing No. 5), and be tied to the horizontal supports with thin wire or twine; if there is any overlapping, the lower layer should overlap the one above, when viewed from the inside of the crib, to permit proper run-off of rain water. It must be stressed, however, that the maximum amount of free space should be left between successive stalks or laths, consistent with retaining the cobs, to allow of free air movement through the stack, and that the cobs should be as clean as possible, with a minimum of attached silk or debris.

In conclusion, it must be pointed out that the abovementioned drawings and dimensions for the erection of cribs are purely the result of calculation. The writers have not yet constructed such cribs.

Agricultural Engineering.

IV. Hydraulics : Simple Pumps and the Delivery of Water.

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THE science which deals with problems connected with liquids in motion is called hydraulics, and under this heading the raising and delivery of water by means of simple pumps are briefly discussed in this article.

The most common causes of inefficient and uneconomical pumping plants—and often of complete failure—are the use of too small piping for the required quantity of water, and the application of insufficient power to perform the work.

In the following discussions the writer has endeavoured to present in practical language the fundamental principles of the pumping of water, so that they will be easily understood by both student and farmer, and it is hoped that the work will at least be a guide to those who have to select pumping plant.

Properties and Behaviour of Water.

One gallon of water weighs 10 pounds.

One cubic foot of water = 6.24 gallons.

One cubic foot of water weighs 62.4 pounds.

Water is only slightly compressible.

The pressure of water is equal in all directions.

Water will always seek its own level, and the surface of water at rest is horizontal.

The pressure water exerts is in proportion to its depth, irrespective of its volume or extent.

When water flows in a pipe, there is friction not only between the particles of water, but also between the water and the bounding surface of the pipe.

Simple Pumps.

The two types of pumps most commonly used in farming operations are the “reciprocating” pump and the “centrifugal” pump.

1. Reciprocating Pumps.

The reciprocating pump may be either (a) single acting, with one or more cylinders, or (b) double acting, again with one or more cylinders.

With the single acting reciprocating pump, an outward and inward stroke of the plunger are required to deliver water. The outward stroke creates a partial vacuum, causing water to flow into the cylinder through the suction valve. The inward stroke causes the suction valve to close, and delivers the water through the delivery valve.

In the double acting reciprocating pump cylinder, there are inlet and outlet valves on both sides of the piston. A stroke in one direction therefore serves as the suction stroke for the cylinder on one side of the piston, and also as the delivery stroke for the cylinder on the other side of the piston so that water is delivered at every stroke instead of at alternate strokes.

Reciprocating pumps are divided into (a) “lift” pumps, and (b) “lift and force” pumps. The “lift” pump raises the water by suction to a cylinder, and there discharges it. The “lift and force” pump raises the water by suction to the level of the cylinder,

and then forces it through pipes to any desired height above that level.

The "lift" pump (Fig. 1) consists of a cylinder C, a suction valve V, a piston or plunger P, with a delivery valve V2 opening upwards, a suction pipe S, and an outlet O.

The "lift and force" pump (Fig. 2) is similar to the "lift" pump, with the exception that it has a packing box B. An air chamber A is advisable in force pumps, especially if the delivery head is great. The function of the air chamber is to act as an air cushion or spring, since the air in the chamber is compressed in its upper part during the forcing action of the pump, and, when such action is checked by the reversal of the pump stroke, the resulting elasticity acts upon the water column as a spring, tending to keep it in motion, pending the following forcing stroke, and thus aids the action of the pump and prevents shock.

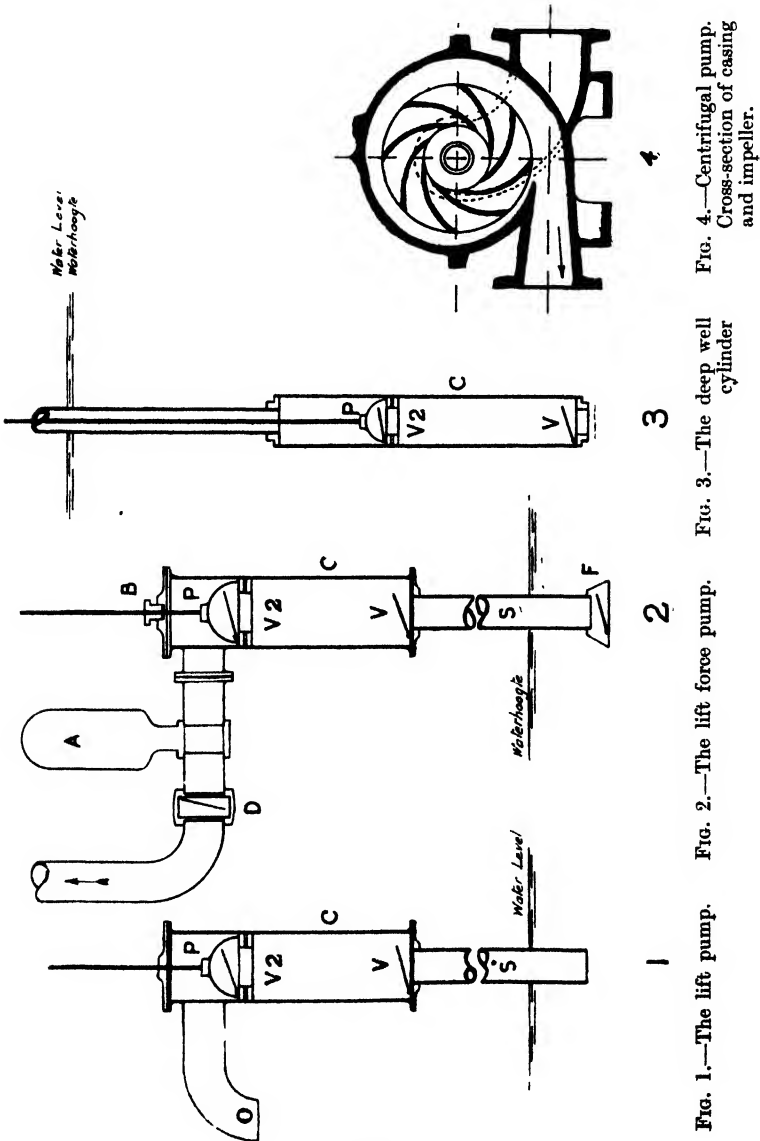


FIG. 4.—Centrifugal pump. Cross-section of casing and impeller.

FIG. 3.—The deep well cylinder

FIG. 2.—The lift force pump.

FIG. 1.—The lift pump.

SIMPLE PUMPS.

It is also advisable to have a non-return valve D on the delivery pipe to aid the action of the pump still further. In all "lift" pumps the suction pipe should have a foot valve F, as the water raised in the suction pipe is liable to slip back. The foot valve keeps the water gained at each stroke, and, if properly fitted, retains the pipe full of water when pumping is discontinued.

Atmospheric Pressure.

The weight of the atmosphere at sea level is equal to that of a column of mercury 30 inches high, or a column of water 34 feet high. Thus, at sea level, the pressure of the air is $\frac{34 \times 62.4}{144}$, or nearly 14.7 lb. per square inch. It follows that, if the end of a vertical pipe is inserted in water, and the air then withdrawn from the pipe so that a vacuum is created therein (or the space in the pipe is void of any pressure), the water will be forced up the pipe into the vacant space since the water outside the pipe is subject to an atmospheric pressure of nearly 15 lb. per square inch.

The theoretical height, therefore, to which water will rise in the pipe under a perfect vacuum at sea level is 34 feet. At this height it would balance the atmospheric pressure, and will remain so balanced as long as the vacuum is maintained within the pipe. Hence, the suction lift of a pump is due solely to the pressure of the atmosphere on the free water surface, and its maximum height depends upon the ability of the pump to produce a vacuum in the suction pipe.

The theoretical maximum is 34 feet, but air-leaks, friction and vapour pressure existing over the water surface combine to reduce the maximum to 25 feet. It is advisable to limit still further the vertical lift at sea level to 20 feet for reciprocating pumps, and to 16 feet for centrifugal pumps when pumping cold water.

As the atmospheric pressure alone is responsible for raising the water into the pump, any reduction in the pressure due to altitude also reduces the available suction lift by approximately 1 foot for every 1,000 feet of altitude, it being assumed that the temperature remains unchanged.

Any rise in temperature also reduces the possible suction lift at that altitude. Such then, are the limitations of the suction pump due to natural laws.

TABLE I.—*Barometric pressure at different altitudes, and equivalent heads of water and vertical suction lifts of pumps.*

Altitude, in feet.	Barometric pressure.	Equivalent head of water.	Practical suction lift of pump.	
			Reciprocating.	Centrifugal.
	lb./sq. in.	Feet.	Feet.	Feet.
Sea level.....	14.7	4.0	20	16
1,320.....	14.02	32.4	19	15
2,640.....	13.33	30.8	18	14
3,960.....	12.66	29.3	17	13
5,280.....	12.02	27.8	16	12
6,600.....	11.42	26.4	15	11
7,920.....	10.88	25.1	14	10

The lifts in the last two columns (Table I) are from the surface of the water in the well to the highest point reached by the plunger or to the "eye" of the centrifugal pump, and represent the vertical heights to which suction pumps will raise water at different altitudes, with properly proportioned suction pipes.

Deep Well Pumping.

In pumping from greater depths than what atmospheric pressure will allow, the cylinder must be placed below the rest level of the water, i.e. below the depth at which the level of the water ceases to fall during continuous pumping. The general features of the deep well cylinder (Fig. 3) resemble those of the surface cylinder in that it has a suction valve V and a plunger P with cage and delivery valve V2 operating upwards. The rising main is screwed to the top of the cylinder, the plunger being operated by rods running up the rising main to the power plant above.

Capacity of Reciprocating Pumps. -- Theoretically the capacity of a cylinder whose diameter is D inches and whose stroke length is L inches, is $\pi \times \frac{D^2}{4} \times L$ cubic inches.

The capacity in gallons would therefore be $\pi \times \frac{D^2}{4} \times L \times \frac{6.24}{1728}$.

If the capacity of the cylinder be multiplied by N, the number of pump strokes per minute, the discharge of the cylinder in gallons per minute is obtained.

Thus, discharge = $\pi \times \frac{D^2}{4} \times L \times \frac{6.24}{1728} \times N$ gallons per minute.

The following are modifications of the above formula :—

$$(a) G = 0.034D^2 \times L \times N$$

where G = discharge in gallons per minute,
 D = diameter of cylinder in inches,
 L = pump stroke in feet, and
 N = number of strokes per minute.

$$(b) Q = \frac{D^2 \times S \times N}{6} \text{ (approximately)}$$

where Q = discharge in gallons per hour,
 D = diameter of cylinder in inches,
 S = pump stroke in inches, and
 N = number of strokes per minute.

As stated above, the equations give the theoretical discharge of the pump and a deduction of 10 per cent. must be made for valve slip. Hence the actual discharge is 90 per cent. of the theoretical values given by the above formulae.

Example.—How many gallons of water per hour will a 6-inch cylinder with an 18-inch stroke deliver when making 30 strokes per minute?

$$\text{Discharge} = \frac{22}{7} \times \frac{36}{4} \times 18 \times \frac{6.24}{1728} \times 30 \times 60 \times \frac{90}{100} = 2,978 \text{ gallons.}$$

Or, using equation (a)

$$\text{Discharge} = 0.034 \times 36 \times 1.5 \times 30 \times 60 \times \frac{90}{100} = 2,975 \text{ gallons.}$$

Or, by equation (b)

$$\text{Discharge} = \frac{36 \times 18 \times 30}{6} \times \frac{90}{100} = 2,916 \text{ gallons.}$$

2. The Centrifugal Pump.

The centrifugal pump, one of the simplest of machines mechanically, has, because of its merit, become one of the most used appliances for moving water, or any liquid which will flow through a pipe, to almost any height, and is by far the cheapest form of power-driven pump for irrigation purposes. Since this pump has basically only one moving part, it is cheap to manufacture and simple to operate and maintain, and, since its size may range from $\frac{3}{4}$ inch to over 100 inches, there are few pumping problems to which it has not been applied.

It is important, however, that the fundamental principles governing the operation and the selection of the centrifugal pump be understood, because, although it is reasonably efficient when performing its correct duty, incorrect selection and application can be extremely uneconomical.

In its simplest form the pump consists of an impeller or disc with vanes fixed to a shaft which revolves at high speed inside a casing with "suction" and "discharge" openings (Fig. 4). The pump is first "primed", i.e. the casing and suction pipe are completely filled with water, and the impeller is then rotated at the required speed by an engine. The vanes on the impeller impart a velocity to the water which is thrown outward by centrifugal force. The casing is so designed as to gather the moving water and guide it to the discharge opening. The greater the speed of the impeller, the greater will be the height to which the water will be forced up the delivery pipe. In being thrown outwards by the impeller the water evacuates the centre or the "eye" of the impeller, thus causing a reduction in pressure at this point.

The suction pipe is led in at the "eye" of the impeller (as indicated in Fig. 4), and, owing to the reduced pressure, a vortex is formed at this entry point, and the pressure of the atmosphere acting on the free water surface then forces the water up the suction pipe into the pump casing.

Since the centrifugal pump is incapable of evacuating air and as the suction is dependent upon the vortex formed, this pump, as previously mentioned, will not provide the same suction lift as the reciprocating pump.

The height to which water can be delivered above the pump can be increased by fitting more than one impeller, the inlet of the second impeller being taken from the outlet of the first, and so on. These additional impellers are called stages. The same result can be obtained by connecting two or more pumps in series, provided the casings will stand the pressure generated.

In selecting a centrifugal pump for certain pumping operations, the *duty* should first be considered, and the pump selected that will perform this duty most efficiently. The practice of adopting a certain size of pump, and then trying to adapt a duty to it, can only lead to inefficiency of operation.

In Table II, which is given purely as a guide, the approximate duties for different sizes of centrifugal pumps are given, the size of the pumps being indicated by the size of the delivery outlet.

TABLE II.—*Approximate duties for different sizes of centrifugal pumps.*

Gallons per minute.	Total head (feet).	Size of pump (ins.).	Revs. per minute.
200.....	30	3	1,460
200.....	50		1,735
200.....	80		2,090
300.....	50		1,960
300.....	70		2,175
300.....	30	4	1,250
300.....	50		1,540
300.....	80		1,890
500.....	50		1,760
500.....	80		2,050
600.....	30	5	1,310
600.....	50		1,570
600.....	80		1,910
800.....	50		1,700
800.....	80		2,020
800.....	30	6	1,130
800.....	50		1,370
800.....	80		1,680
1,100.....	50		1,480
1,100.....	80		1,770
1,100.....	30	7	1,000
1,100.....	50		1,210
1,100.....	80		1,470
1,600.....	50		1,350
1,600.....	80		1,570
1,600.....	30	8	920
1,600.....	50		1,090
1,600.....	80		1,330
2,000.....	50		1,180
2,000.....	80		1,390

Efficiency of Centrifugal Pumps.

The efficiency of centrifugal pumps usually improves as the size of the pump increases, but the efficiency of any given pump varies considerably according to the duty it is called upon to perform. Hence, for efficient operation, the duty must again be considered first, and the pump selected which will perform that duty at its highest efficiency. For example, if 300 gallons of water must be pumped per minute to a total head of 50 feet, a 3-inch pump would probably be selected at a speed of 1,900 R.P.M., and the efficiency would be, say, 70 per cent. If this same pump is to pump 200 gallons per minute by running it at a slower speed, the efficiency would drop to, say, 60 per cent., so that it would be more economical to use a smaller pump for this duty of 200 gallons per minute.

Similarly, if under the same conditions the 3-inch pump were speeded up to give 400 gallons per minute, the efficiency would again drop, and it would probably be more economical to use a larger pump at a lower speed. The efficiency depends upon the design of the pump and cannot be generalized, but, as a rough guide for average pumping conditions, the following efficiencies may be assumed:—

SIMPLE PUMPS.

TABLE III.—*Efficiencies for average pumping conditions.*

	<i>Per cent.</i>
Up to 5,000 gallons per hour	50 to 55
From 5,000 to 15,000 gallons per hour	60 to 65
From 15,000 to 20,000 gallons per hour	65 to 70
From 20,000 to 50,000 gallons per hour	70 to 75

In considering pumping projects where water has to be pumped from a river, one is often confronted with the problem of a long suction pipe. Since the vertical suction lift of the pump is restricted, and as long suction pipes are undesirable because of possible air leaks, the suction lift should be as small and as direct as possible.

The height to which water may be pumped, depends upon the design of the pump and the power applied to drive it.

In order to calculate the *horse power* of a pump, it is necessary to know the weight of water raised, and the total vertical height or *total lift* through which the water is to be raised.

To be able to understand fully what "total lift" means, it is necessary to know something about the frictional losses in pipes, and how these affect the flow of water.

Flow of Water in Pipes.

When water flows through a pipe, there is resistance to the flow, caused chiefly by the rubbing of the water against the pipe surface. This resistance is termed *pipe friction*. Because of this friction and the resulting sluggish flow, a certain amount of "assistance" is required to aid the flow through the pipe.

The faster water is made to flow and the greater the length of the pipe, the greater will be the "assistance" needed.

It is also obvious that more "assistance" would be required for a certain quantity of water through a 1-inch pipe, than would be necessary for the same quantity to flow through a 2-inch pipe.

We know that if a pipe be so placed that the end into which we pour water, is a little higher than the exit end, the water will begin to flow, and the speed of the water, and consequently the amount of water which the pipe is capable of carrying when running full, will increase as the intake end is raised above the exit end.

The "assistance" which urges the water to move along the pipe, translated into elevation required to cause a certain amount of water to flow through a pipe at a given speed, is called *friction head*, and is the height that the intake end of a pipe must be raised above the outlet end, in order to overcome the inertia of the water in the pipe, which: (1) increases approximately as the square of the velocity of the water, (2) increases directly with the length of the pipe-line, (3) increases with the roughness of the inside of the pipe, (4) increases with the number of bends or restrictions in the pipe-line, (5) increases with the quantity of water induced to flow through the pipe-line, and (6) is inversely proportional to the diameter of the pipe.

Hence, in dealing with the free flow under gravity in straight pipe lines flowing full, the fall given merely to overcome pipe friction should be equal to the friction head. In problems on the pumping of water, friction head should not be confused with *static head*, i.e., the difference in elevation between the surface of the free water and the point of discharge.

In suction pumps, the static head is made up of the *suction head* and the *delivery head*. The "total lift" of the suction pump is therefore made up of *static head* and *friction head* or, in other words, *suction losses* + *suction head* + *delivery head* + *delivery losses* (Fig. 5).

Since the frictional resistance in pipes varies approximately as the square of the velocity, it can be diminished by using pipes of ample size for the delivery, as well as for the suction.

Several formulae have been evolved for determining in a practical way the friction head or, alternately, the quantity of water which a pipe of given bore and length is capable of delivering in a given time, but most of these are really of little use to the layman.

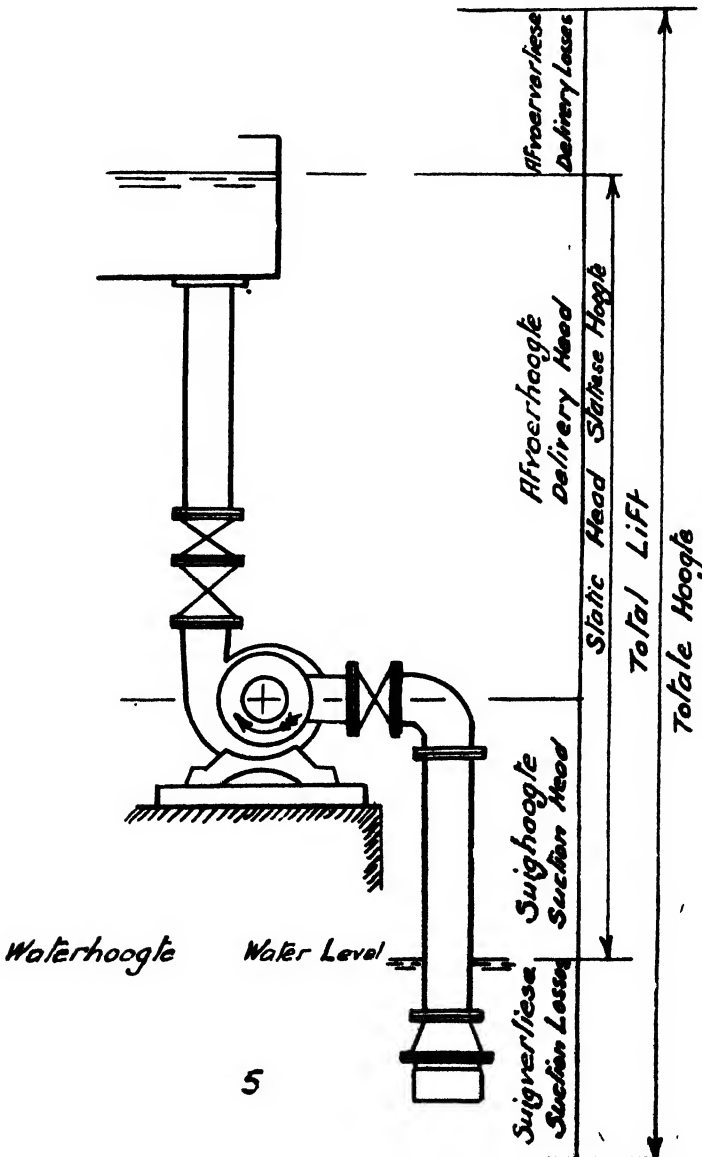


FIG. 5.—Diagram showing how "total lift" is made up.

SIMPLE PUMPS.

A simple formula much used, although it gives results which are excessive, is that known as Box's formula in which—

$$H = \frac{Q^2 \times L}{(3 \times d)^5}$$

$$\text{Or, } Q = \sqrt{\frac{(3 \times d)^5 \times H}{L}}$$

where Q = discharge of pipe in gallons per minute,
 d = diameter of pipe in inches,
 L = length of pipe in yards, and
 H = friction head of water in feet.

Example.—Find the head required for a 7-inch pipe to discharge 30,000 gallons of water per hour, if the length of the pipe is 1,200 feet.

$$H = \frac{(500)^2 \times 400}{(3 \times 7)^5} = 24.5 \text{ feet.}$$

Useful tables for determining the friction head have been compiled and can be found in handbooks and in catalogues issued by manufacturers of hydraulic machines.

Table IV gives the approximate loss of head, for new pipes, due to friction in a straight pipe line.

Horse Power (H. P.) of Pumps.

Suppose it is required to pump 40,000 gallons of water per hour with a centrifugal pump, and to deliver the water 1,500 feet from the pump against a height of 40 feet above the pump. If the suction lift is 10 feet, and the length of the suction pipe 40 feet, compute the horse power necessary at an altitude of 4,000 feet.

Reference to Table II will show that a 5-inch pump will have to be used.

The total length of piping involved is $40 + 1,500 = 1,540$ feet. To reduce the friction head in the pipe line means reducing the total lift, and thus the ultimate horse power necessary, since the horse power is directly proportional to the total lift.

The question of the comparative cost of the engine and pipes should be carefully gone into, because a point may be reached where the additional cost of larger pipes outweighs the cost of a larger engine, and in that case additional friction head within reasonable limits may be tolerated, and a larger horse power engine adopted.

By referring to Table IV we find that the friction head for an 8-inch pipe discharging 700 gallons per minute is 1.44 feet per 100 feet, or 22 feet (nearly) for a pipe line 1,540 feet long, while for a 9-inch pipe the friction head is 14 feet (nearly).

This gives a total lift of $40 + 10 + 22 = 72$ feet for an 8-inch pipe, and 64 feet for a 9-inch pipe.

A total lift of 72 feet is not excessive, and the comparative cost of engines and pipes will have to decide the issue.

As a general rule, however, it is not economical to have the friction head greater than 25 per cent. of the static head.

TABLE IV.—Approximate loss of head, in feet, due to friction of water per 100 feet of new piping.

Delivery in gallons per minute.	Size of pipes (inside diameter in inches).													
	$\frac{1}{2}$	1	1 $\frac{1}{2}$	2	3	3 $\frac{1}{2}$	4	5	6	7	8	9	10	12
5.....	14.0	4.0	1.4	0.5	—	—	—	—	—	—	—	—	—	—
10.....	44.0	13.0	3.5	2.0	0.5	—	—	—	—	—	—	—	—	—
15.....	102.0	26.0	9.0	3.5	1.0	—	—	—	—	—	—	—	—	—
20.....	180.0	44.0	15.0	6.0	1.5	—	—	—	—	—	—	—	—	—
25.....	—	64.0	21.0	9.0	2.2	0.25	—	—	—	—	—	—	—	—
30.....	—	93.0	31.0	13.0	3.0	0.32	—	—	—	—	—	—	—	—
40.....	—	—	54.0	22.0	5.0	0.72	0.20	—	—	—	—	—	—	—
50.....	—	—	87.0	32.0	8.0	1.10	0.30	—	—	—	—	—	—	—
75.....	—	—	—	73.0	17.0	2.50	0.62	0.19	—	—	—	—	—	—
100.....	—	—	—	109.0	32.0	4.50	1.20	—	0.16	—	—	—	—	—
125.....	—	—	—	—	7.30	3.20	1.70	0.53	0.24	0.104	—	—	—	—
150.....	—	—	—	—	10.00	4.70	2.50	0.76	0.34	0.15	—	—	—	—
200.....	—	—	—	104.0	18.50	8.30	4.25	1.33	0.60	0.26	0.16	0.078	—	—
250.....	—	—	—	—	27.50	12.50	6.45	2.05	0.92	0.40	0.20	0.12	—	—
300.....	—	—	—	—	40.00	18.00	9.30	3.00	1.30	0.57	0.29	0.17	0.095	—
350.....	—	—	—	—	—	24.20	12.50	4.00	1.75	0.75	0.38	0.23	0.127	—
400.....	—	—	—	—	—	21.90	16.30	5.20	2.27	0.99	0.50	0.30	0.166	0.07
450.....	—	—	—	—	—	—	20.00	6.50	2.80	1.20	0.62	0.38	0.200	0.086
500.....	—	—	—	—	—	—	25.00	8.00	3.40	1.50	0.76	0.46	0.250	0.110
600.....	—	—	—	—	—	—	34.00	11.30	4.80	2.10	1.07	0.65	0.360	0.150
700.....	—	—	—	—	—	—	—	15.40	6.50	2.80	1.44	0.87	0.430	0.200
800.....	—	—	—	—	—	—	—	19.60	8.50	3.30	1.83	1.10	0.620	0.260
900.....	—	—	—	—	—	—	—	25.00	10.20	4.50	2.30	1.40	0.770	0.330
1,000.....	—	—	—	—	—	—	—	31.00	12.90	5.60	2.80	1.70	0.950	0.400
1,200.....	—	—	—	—	—	—	—	—	18.20	8.00	4.05	2.45	1.350	0.580
1,400.....	—	—	—	—	—	—	—	—	24.00	10.80	5.40	3.25	1.800	0.760
1,600.....	—	—	—	—	—	—	—	—	—	13.70	7.00	4.20	2.330	1.000
1,800.....	—	—	—	—	—	—	—	—	—	17.10	8.70	5.25	2.900	1.230
2,000.....	—	—	—	—	—	—	—	—	—	21.00	10.70	6.50	3.500	1.500

Supposing the 8-inch pipe is adopted, then the weight of water raised per hour = $40,000 \times 10$ pounds, so that the theoretical work done per minute = $\frac{40,000 \times 10 \times 72}{60}$ foot pounds, and the *theoretical* or water horse power required to perform this work = $\frac{40,000 \times 10 \times 72}{60 \times 33,000} = 14.54$.

But there is inefficiency of the pumping plant due to friction, slippage, etc., and the engine must therefore exert extra power to overcome these inefficiencies, and still provide an excess of power for decreases in efficiency of the engine as it gets older.

Now, since the efficiency of the pump in this case is 70 per cent. (See Table III), it means that for every 7 h.p. used to pump water, 10 h.p. will have to be supplied by the engine. Hence, the *practical* horse power absorbed by the pump is $14.54 \times \frac{10}{7} = 20.77$.

To provide for the decrease in efficiency of the plant as it gets older, 1 h.p. for every 5 h.p. should be added. Hence, we need an engine of $20.77 + \frac{20.77}{5} = 24.92$ h.p.

The power of an internal combustion engine, however, decreases by approximately 4 per cent. for every 1,000 feet rise above sea level. Hence the engine must provide an additional 16 per cent. of power at an altitude of 4,000 feet. This brings the horse power of the engine up to $24.92 + (24.92 \times \frac{16}{100}) = 28.91$.

Provision must also be made for loss of power due to temperature. The British Standard Specifications specify, in addition to the allowance for altitude, a further loss of 2 per cent. of power for every 10° F. above 62° F. A normal range of 30° F. may be assumed, so that the engine must provide a further 6 per cent. of power. The *actual* horse power necessary is therefore $28.91 + (28.91 \times \frac{6}{100}) = 30.63$.

It should be noted that the end of the suction pipe should never be less than 3 feet below the water surface.

If an electric motor is used, the actual horse power would be the practical h.p. + 25 per cent.

Centrifugal Borehole Pump.

For deep well pumping, the centrifugal borehole pump may be used. This pump is a multi-stage unit driven at high speed by an engine on the surface. The pump should be used only on exceptionally strong boreholes whose capacity is 2,000 gallons per hour upwards.

The pump consists of a tube with a vertical spindle carrying a number of impellers. The intermediate spindle bearings are supported by spider rings about 7 feet apart.

3. The Hydraulic Ram.

The hydraulic ram is a useful self-acting apparatus which utilizes the momentum of a stream of water falling a small height to raise part of the water to a greater height.

The extreme simplicity of the hydraulic ram, and the ease which it can be adjusted to work with varying quantities of water, renders it particularly suitable for supplying water for domestic purposes to farm houses situated near a stream. In the simple arrangement shown in Fig. 6 the water is supplied from a supply cistern through a pipe A called the *drive pipe* into a chamber B called the *body* which has two valves, V called the *waste valve* and V2 called the *delivery valve*. When no flow occurs, the valve V is off its seat, while the valve V2 rests upon its seating. If water is allowed to flow along the drive pipe, it will escape through the valve V, and the energy of the water passing through the open valve causes the valve to close. As the valve commences to close, the velocity of the water passing through increases and the rate of closing accelerates. The rapid closing of this valve arrests the motion of the water in the drive pipe, and there is a sudden rise of pressure in the body chamber, which causes the delivery valve V2 to open, and a portion of the water passes into the air chamber.

The water in the drive pipe and in the body chamber, after being brought to rest, recoils rather violently, and the pressure in the body chamber again diminishes, allowing the waste valve once more to open, and the water again to flow through it.

The cycle of operations is then repeated: More water is forced into the air chamber, in which the air is compressed, and water is forced up the delivery pipe to the desired height.

The Valves.—The valves are controlled by springs for some device which can be regulated so that the number of beats per minute is completely under control, and can be rapidly adjusted to suit varying heads and conditions. The valve may make as many as 200 pulsations per minute, but under normal circumstances the pulsations range from 80 to 120 per minute.

The Snift Valve.—As the water passes through the delivery valve into the air chamber, a little air should be taken with it in order to maintain the quantity of air in the chamber, and a suitable *snift* valve should be provided in the neck of the air chamber just below the delivery valve (Fig. 6), to allow the admission of a snift of air at each pulsation, thus keeping the air chamber properly charged with air.

Drive Pipe and Supply Head or Fall.

The drive pipe should be laid perfectly straight, and should be at least 25 to 60 feet in length according to the fall and height of delivery. Good results have been obtained with drive pipes having a length up to 10 times the fall, but in general it may be said that the best results are obtained with drive pipes whose lengths are from $4\frac{1}{2}$ to 6 times the working fall. Working falls from $2\frac{1}{2}$ feet up to 80 feet can be used to work a ram, but the more the fall, the less will be the cost of the ram, and the less the driving water required for a given quantity of water to be delivered.

Delivery Pipe and Total Lift.

The connection on the ram for the delivery pipe is determined by the makers and is stated for each size of ram. In considering long delivery pipe lines, friction must be taken into account. The total lift, i.e. the delivery head plus the friction head, may be anything up to 500 feet.

SIMPLE PUMPS.

Scanty Supplies.

A ram can be made to work with as little as one gallon of water per minute. The water is allowed to trickle into a cistern, until the level reaches a small pipe leading to a metal container, to which a chain running over a grooved pulley is attached (Fig. 7). The other end of the chain is fastened to a hinged weighted outlet valve in the floor of the cistern which admits water to the drive pipe. When the container is nearly full, it automatically lowers and opens the intake valve. Small holes in the bottom of the container allow the water to flow out slowly, after which the intake valve again closes automatically, and the cistern again fills up to provide a fresh supply to the ram.

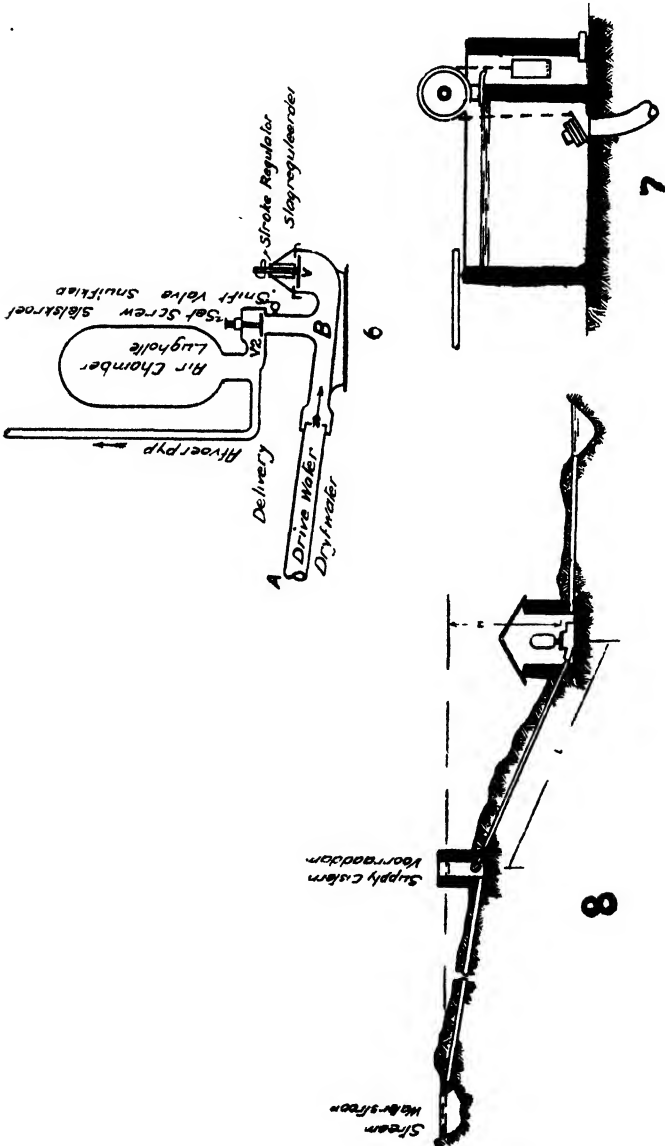


Fig. 6.—Simple diagram of a ram showing its essentials. Note the position of the snift valve.

Fig. 7.—Cistern with pulley and chain to lift valve where only small amounts of water are available for working a ram.

Fig. 8.—Diagram showing water conducted from a stream to a supply cistern for the ram.

Drive Water and Supply Pipe.

It is desirable to take the drive water in a supply pipe from the stream to a supply cistern out of which the drive pipe leads (Fig. 8). There should be suitable strainers on the end of the supply pipe in the stream, as well as on the intake to the drive pipe in the supply cistern.

Efficiency of Hydraulic Rams.

The efficiency of a ram rapidly decreases with an increase in the height to which the water is to be raised, as will be observed from the following table.

Proportion of lift to fall.....	4	5	6	7	8	9	10	11	12	13	14	15	16	18	20	25
Efficiency, per cent.	76	74	72	70	67	63	56	49	43	37	32	28	24	19	14	3

Sizes of Rams and Their Approximate Duties Under Various Conditions.

The size of the ram is usually known by the diameter of the drive pipe.

Diameter of the drive pipe.....	1½"	2"	3"	4"	5"	6"
Adjustable to work with any quantity of driving water in gallons per minute from.....	2½-6	5-12	13-30	25-50-	40-80-	60-170-
Suitable for forcing to any height in feet up to.....	500	500	400	400	400	400
Quantity of water raised per 24 hours in gallons.....	200 to 1,400	350 to 3,000	250 to 7,000	1,500 to 13,000	2,400 to 20,000	2,800 to 28,000
Diameter of delivery pipe.....	¾"	1"	1½"	1½"	2"	2½"

Since there are no two sources of supply whose conditions are exactly alike, it is obvious that a ram that will operate well on one supply will not work satisfactorily on another. Hence, to obtain the highest efficiency, the ram should be designed to suit the conditions of the source.

The following data are necessary when placing an order for a ram:—

(1) The minimum quantity of water in cusecs or gallons available per minute.

(2) The vertical fall *H* in feet (Fig. 8), which can be obtained from the source of supply to the proposed site for the ram.

(3) The distance *L* in which the fall is obtained, i.e. from the source to the proposed site.

(4) The quantity of water in gallons required to be delivered in 24 hours.

(5) The vertical height or lift in feet to which the water is to be forced above the level of the ram.

(6) The length of the delivery pipe.

Prospective buyers of hydraulic rams are often curious to know what proportion of the drive water is actually raised by a ram.

SIMPLE PUMPS.

In a certain case 31,500 gallons of driving water raised 3,400 gallons to a height of 76 feet with a fall of 11 feet.

Hydraulic rams can be used in batteries of two or more, and it is quite often more economical to install two small rams rather than one large one to deliver the same quantity of water. This, of course, applies only to cases where the quantity of water to be raised is comparatively large.

4. Windmills.

The tables below give the output in gallons per hour for different sizes of windmills. The figures assume a back-gearred ratio of 3 to 1, and allow for 10 per cent. slip.

If the total lift exceeds 200 feet, windmills are uneconomical and a small powerhead and engine should be used.

Eight-foot wheel with six-inch stroke.

Diameter of cylinder in inches.	Total lift in feet.	Gallons per hour.	
		35 strokes per minute.	50 strokes per minute.
2	110	127	183
2½	75	200	286
3	54	290	415
4	32	510	730
5	21	800	1,145

Ten-foot wheel with six-inch stroke.

Diameter of cylinder in inches.	Total lift in feet.	Gallons per hour.	
		27 strokes per minute.	40 strokes per minute.
2	210	98	147
2½	144	154	230
3	103	224	335
4	61	400	590
5	40	618	920
6	28	892	1,325

Twelve-foot wheel with eight-inch stroke.

Diameter of cylinder in inches.	Total lift in feet.	Gallons per hour.	
		22 strokes per minute.	33 strokes per minute.
2½	236	167	251
3	174	243	364
4	106	428	642
5	70	670	1,010
6	49	970	1,450

In conclusion it should be pointed out that the subject of the delivery of water by means of pumps is a vast one and that the discussions in this article are by no means complete. It is therefore

Pruning Experiments with Winter Nelis Pears.

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THE following short summary gives particulars of the results obtained so far in pruning experiments with Winter Nelis pears.

According to an orchard survey made in 1926 there were 629,505 pear trees in commercial orchards in the 13 main fruit-producing districts of the western Cape Province. Of the trees, just over 37 per cent. were in the Ceres district, and of these 40·8 per cent. were Bon Chretiens, while Winter Nelis coming next in the order of varieties constituted 10·6 per cent. of the total.



FIG. 1.—Eighteen-year-old Winter Nelis tree on farm A, before pruning. Note vigour and denseness of tree, and masses of spurs on branch in foreground, which is typical of all the trees.

It is not known how many pear trees there are in Ceres now after 21 years, but in an economic study of certain aspects of the deciduous fruit industry made in 1937-38 by Pretorius, Prinsloo and de Waal on 24 farms in the Ceres district, Winter Nelis accounted for 12·5 per cent. of the total number of pear trees and was still maintaining second position.

Winter Nelis is an important commercial variety in other areas as well as in Ceres, and in 1926 it made up over 8 per cent. of the total number of pear trees in the western Cape Province.

Although Winter Nelis is a good quality late variety, many growers complain about its cropping. This dissatisfaction seems to become more general as the trees become full-grown, and in the

Ceres district in particular a generally satisfactory crop of Winter Nelis has practically been an unknown occurrence during the past few years. Consequently, some growers have either taken out their trees or top-worked them to other varieties.

From a pomological point of view two of the factors which might be a cause of these unsatisfactory yields are incorrect pruning and lack of cross-pollination. The past season's experiments were started to test the relative importance of these two factors. The results have not all been fully analysed as yet, since growth records have still to be taken during the winter. Furthermore, with fruit trees, experimental results covering one year cannot be regarded as conclusive. Yet such striking differences were obtained with the different pruning treatments that it is felt that these results should be published as a preliminary report before the next pruning season.

The Experiment.

Experiments were carried out on two farms in the Ceres district. In the case of farm A there were about 400 large 18-year-old Nelis pear trees on good alluvial soil under irrigation. As Fig. 1 shows, the trees were vigorous but rather dense with shoots and branches, as well as masses of spurs. The grower declared that he had pruned



FIG. 2.—Thirty-year-old Winter Nelis tree on farm B, before pruning.
Note masses of branches.

harder than usual in 1946, chiefly removing branches, but in the authors' opinion this pruning was not nearly enough, and for the purpose of the experiment the trees were regarded as being lightly pruned. Two random plots of twelve trees each in the same block were alternately given a hard pruning and left unpruned by the authors, while the rest were pruned by the farmer himself. The degree of hard pruning done was what was regarded as necessary for each tree. In actual fact it meant that at least a third of the branches

were removed. No spurs were cut off completely but parts of spurs were pruned as deemed necessary, about 30 per cent. of the fruit buds being removed.

On farm B the trees were large 30-year-old trees which had not cropped satisfactorily for some years. Each tree was a dense mass of branches covered with spurs, as can be seen in Fig. 2. The treatments and lay-out were the same as on farm A, except that in this case more than half the branches were removed, as well as spurs cut off on the hard pruned trees (See Fig. 3). Very few branches were taken out on the lightly pruned trees (by the farmer himself).

Effect of Pruning.

(a) *On fruit setting*:—The figures in Table I show that pruning had a very marked effect on the percentage set on both farms.

TABLE I.—Percentage set, based on approximately 1,000 flowers.

Farm.	Well-pruned.	Lightly-pruned.	Unpruned.	Pollination facilities
A.....	24.5 12.2	2.4 2.3	1.0 0.2	Fair. Poor.
B.....	12.5 7.1	8.0 6.5	6.3 2.6	Fair. Poor.

(b) *On cropping*:—Grower A maintained that these vigorous 18-year-old trees had never cropped satisfactorily. According to production records, the crop averaged only about 1 bushel per tree in 1945 and 1946. As stated above, the grower pruned harder than usual in 1946, and his 1947 crop was about three times that of the two previous years. Although the trees naturally varied, pears bore well in most orchards in Ceres during the past season. Nevertheless, the figures presented in Table I prove that pruning had a very marked effect on the cropping of these trees.

TABLE II.

Number of Trees.	Weight of Fruit (per tree).	Treatment.
12	259 lb.	Correctly pruned; excess branches and parts of spurs removed.
10	164 lb.	Too lightly pruned; only a few branches removed.
12	34 lb.	Unpruned.

Unfortunately just prior to the harvesting of orchard B a strong wind blew off so much of the fruit that no crop record could be made in this orchard. However, the weight of a random sample of 50 pears from each of a number of trees was determined. The average weight of 50 pears from each of six unpruned trees was 11.8 lb., and that for each of six well-pruned trees 15.2 lb.

Another grower in the district who normally was getting better returns from his Winter Nelis but not yet to his satisfaction, also resorted to very drastic branch and spur pruning in 1946, and about trebled his production in 1947.

Though no measurements have as yet been made, it can be stated that the harder pruned trees put on better growth and had larger leaves of a darker green colour.

Discussion.

Variations in production from year to year are an accepted fact with fruit trees. The pear, including the variety Winter Nelis, is no exception to this. Usually a heavy crop is followed by a lighter one, or *vice versa*, and the grower says his trees crop irregularly. Some varieties are more apt to crop irregularly than others, while at the same time some are regarded as heavy croppers and others as shy bearers.

Again, in some seasons all factors appear to be congenial for fruiting and trees crop well under a wide range of conditions. It can be stated that this was the case with pears in the western Cape Province during the past season. Most growers had record crops of nearly all their pear varieties, including the Winter Nelis. During other years again the very opposite might be the case.



FIG. 3.—Thirty-year-old Winter Nelis tree on farm B, after pruning.

The Winter Nelis appears to be a variety which does not alternate regularly but which is inclined, especially as the trees get older, to crop heavily one season and then produce light crops for a number of years in succession. A possible reason for this is the nature of growth and blossom-bud development in this variety.

A common explanation for irregular cropping is that heavy crops are usually associated with small light-green and consequently less efficient leaves. The heavy crop takes all the available energy, leaving

no reserves for fruit-bud development for the following year's crop. A light crop is, on the other hand, generally accompanied by large dark-green efficient leaves, producing abundant reserves for fruit-bud differentiation and development. The Winter Nelis cannot be expected to react differently in this respect, but blossom years are not always crop years. In an on-year, judging from the number of fruit buds, this variety generally blossoms more profusely than most other pear varieties. The opening flowers severely drain the reserve energy of the tree, often depleting it to such an extent that even leaf development is seriously affected, as was evidenced in the case of the unpruned trees in this experiment. With old Winter Nelis trees the opening of such an abundance of flowers seems to leave no reserve for the setting and formation of the fruit unless a very adequate reserve has been built up and other conditions are at an optimum. The older the tree becomes, the longer does it take to accumulate this necessary reserve. This is probably why dissatisfaction with the cropping of Winter Nelis increases with the age of the trees and why the removal of excess fruit buds by winter pruning has such a marked effect on the setting of the remaining flowers (See Table 1).

Apart from the effect of the previous year's crop, some other common reasons for irregular cropping are the condition of the tree, climate, nutrition, moisture, pollination, pruning, etc. The object of the grower should be to apply cultural practices in such a way as to ensure a reasonably high but uniform annual production. That pruning is a strong measure at the disposal of the grower for this purpose has often been shown by research workers all over the world. The results obtained in this experiment can be regarded as further proof to this effect.

Conclusion.

In pruning experiments conducted in the Ceres district during the past season, pruning was shown to have a marked effect on the setting, cropping and growth of old Winter Nelis trees. It must be emphasized, however, that the season under consideration was congenial for the cropping of pears in general. Growers must also bear in mind that many cultural practices other than pruning influence the cropping of a tree.

Acknowledgments.—The writers appreciate the interest and co-operation of Messrs. F. J. Bothma and P. C. Malherbe on whose farms the experiments were done. We are also indebted to Messrs. T. Micklem and C. Jeffery of the Western Province Fruit Research Station for assistance with the recording of results, and to Dr. M. W. Black, W.P.F.R.S., for guidance in the compilation of this report.

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The Mango in South Africa.

Part III(a).—Production and Marketing.

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AS is the case with all fruits, in successful mango growing the handling and disposal of the crop produced is in every respect as important as its production. Only in recent years have growers given sufficient attention to this aspect, and those who have adopted the correct methods have obtained well-deserved increased profits. With the expected rapid increase in the quantity of fruit available to the consumer, the best returns will be received by those who handle and market their fruit in the best manner, and indifferent growers may find that they are operating at a loss and only contributing to gluts on the market.

Yields.

Under normal conditions a tree of the Peach or Sabre variety bears its first commercial crop of approximately 20 fruits (one single-layer tray) in 4 to 5 years after planting. Budded or grafted trees of the same variety come into bearing 2 to 3 years earlier. On the whole the individual tree performance of these varieties in the Union is poor. Commercial growers harvest from 3 to 15 single-layer trays off trees 10 years old, and from 8 to 30 trays off 20-year-old trees, depending on the locality and the season. From three to five times this yield is produced by some of the improved varieties when grown in localities well suited to them.

In Java de Jong records a normal yield of from 1,000 to 1,500 fruits on a single tree, although in West Java yields of 300 fruits from 15-year-old trees are considered average for most varieties.

No figures are available as to the total production of mangoes in the Union, but an indication is given in the following table. If it is conservatively estimated that one third of the total crop is not marketed because of disease and that of the remainder half or more is marketed on the eight principal markets in the Union, the annual production approaches two million trays.

*Mangoes sold on eight principal markets in the Union.**

Year (January to December).	Number of Trays.	Value.	Average Price Per Tray.
		£	s. d.
1937.....	247,183	17,341	1 5
1938.....	243,802	17,959	1 6
1939.....	342,064	17,089	1 0
1943.....	347,965	60,622	3 6
1944.....	476,431	78,694	3 4
1945.....	741,292	84,422	2 3
1946.....	764,999	99,259	2 7

* Figures supplied by the Division of Economics and Markets.

Picking.

The first pickings are those of green and as yet immature fruit destined for the chutney trade. The market for these is limited, but constitutes a useful means of disposal of some of the "small fruit". Such fruit calls for no special handling or packing, usually being stripped from the trees and packed in several-layer boxes.

For the fresh-fruit consumer-market no fruit should be picked until it has fully developed and matured on the tree. The despatch of immature fruit to the market has done much harm in hindering the increase of new consumer demand, and has depressed the prices which should be received for first quality properly matured fruit. All traces of "black" green should have disappeared, the fruit being at such a stage that it ripens fully at normal temperatures in not more than ten days, if it is to be sent to distant markets, and five days if intended for nearer markets.

The milky sticky juice which exudes from the fruit when the fruit stalk is broken off right next to the fruit is the bane of the mango picker, for if this juice runs on to the skin of the fruit it causes stickiness and detracts from the appearance when the fruit is subsequently offered for sale. This may largely be avoided by picking the fruit with at least four inches of the stalk attached; the exudation from this stalk is relatively small. Later, when the fruit is packed at the sorting tables, the stalk is snapped off with clippers or scissors about a quarter of an inch from the fruit.

It would be preferable if the fruit on being picked were placed in single-layer trays in which a thin layer of woodwool has been spread, but it is realized that this entails extra labour costs compared with the custom of using the ordinary citrus lug-box with which most growers are equipped. If lug-boxes are used, the fruit should not be packed more than three layers deep at the most, for apart from bruising during transport to the packhouse, a certain amount of juice exuding from the top fruits is bound to drop on to the lower fruits.

Artificial Ripening.

Fruit arriving on markets before the middle of December, provided it is sound and attractive in appearance, commands higher prices than fruit arriving during the height of the season between the third week in December to the third week in January. Also, the longer the fruit hangs on the tree the more it is infected with black spot, particularly during a rainy season. Thus growers tend to pick their fruit as soon as it has developed to full size even though it would improve in quality and colour and still be at the correct stage for marketing if left on the tree for another week or two.

Various methods of hastening ripening and colouring of fruits after picking are being used, the most favoured one being the primitive method of stacking the picked fruit in piles in a warm place for a day or two, the stacks being covered with moist sacking. Fruit treated like this invariably shows heavy infection with black spot by the time it reaches the consumer, even though it appears clean when packed. Experiments conducted by the writer showed that the mango could be artificially ripened and coloured to some degree by subjecting it to ethylene gas for 1 to 2 days. However, on a commercial basis it was found that, unless the fruit was picked at the right stage, properly handled, and the treatment carried out

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in properly constructed chambers which allowed full control over humidity (85-90 per cent.), temperature (70-80°F), ventilation (every 4 hours) and gas concentration (1:5000) during the treatment, often a poorer end product was obtained than when the fruit had been left an additional week or ten days on the tree. Abuse of this treatment by growers who tried to gain more than two weeks in marketing by picking immature fruit and who did not carry out the treatment in the proper manner, resulted in the artificial ripening and colouring of early mangoes falling into disfavour. Acetylene gas generated from carbide placed in water at the rate of 1 ounce of carbide to 72 cubic feet of room space has been found to give results somewhat similar to those obtained with ethylene at an air concentration of 1 in 5,000. If the fruit is not sprayed with Bordeaux within two weeks of picking, or if, after picking, it is not dipped in a 4:4:50 Bordeaux solution plus spreader and partly dried before being put in the treating chamber, it is likely that a heavy incidence of black spot will develop during or after treatment.

Packing.

The use of sorting or grading tables on which the fruit can be spread out, is strongly recommended. When the fruit is transferred from the picking boxes to such a table, the stalks or stems should be clipped, and the fruit wiped with a damp cloth to remove any stains of Bordeaux spray adhering to the skin.

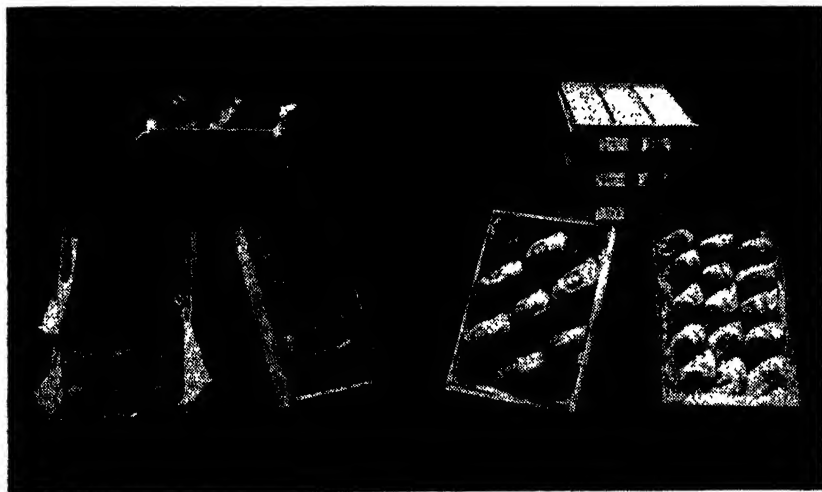


FIG. 1.—Mangoes packed for marketing. Left—no wrapping or woodwool; fruit ungraded and dirty; and boxes unattractive. Right—properly wrapped and packed fruit which has travelled well and presents a pleasing appearance to buyers.

Experience has shown that the best container in which to market mangoes is the single-layer tray. Woodwool in minimum quantities should be used to line the bottom and sides of the tray; the use of too much woodwool with a very tight pack will induce excessive sweating and too rapid ripening when the fruit is transported without refrigeration and is subjected to varying temperatures. Few growers wrap the individual fruits as they consider that such wrappers become sodden on sweating of the fruit, and also, if the fruit is not

wiped clean of juice, the wrapper adheres to the skin, detracting from the general appearance when the tray is opened up. The wrapping of alternate fruits makes quite an attractive pack, but in such cases it might be better if thin twists of woodwool were placed in between individual fruits. If fruit is packed for export it will be essential that every fruit be wrapped and packed in an individual nest of woodwool in the trays.

Fruits of varying sizes should not be packed in the same tray. Both the name of the variety and the number of fruits should be stamped on the labelled end of the tray. The cost of an attractive label is negligible, and its use may have good advertising value. Before the tray is closed, a sheet of paper printed with the grower's brand should be placed over the fruits, and a thin layer of woodwool used between this paper and the slats of the lid. The use of cleats will assist in preventing damage through pressure on the stacked trays during shipment to market.

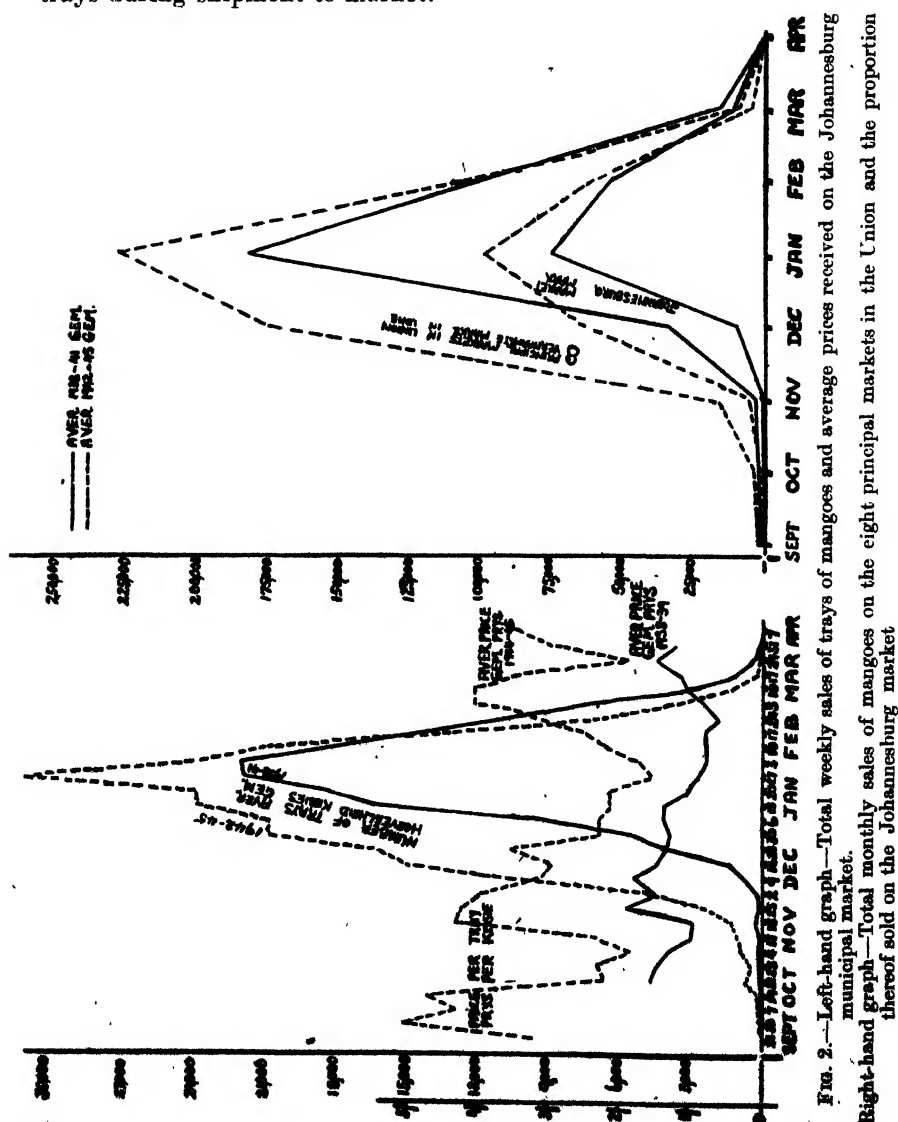


Fig. 2.—Left-hand graph—Total weekly sales of trays of mangoes and average prices received on the Johannesburg municipal market.
Right-hand graph—Total monthly sales of mangoes on the eight principal markets in the Union and the proportion thereof sold on the Johannesburg market.

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Marketing.

While an appreciable portion of the mango crop in the Union is sold direct to consumers on private orders, most is offered for sale on the municipal markets by public auction. The hundreds of smaller markets can each receive only a small number of trays without being flooded, but of the quantity sent to the eight principal markets, Johannesburg, Cape Town, and Pretoria received 80 per cent.

In the right-hand section of the accompanying graphs are shown the total monthly sales on these eight markets (averaged for the periods 1938-41 and 1942-45), with the contributing Johannesburg sales also shown separately. The left-hand section represents the average total weekly sales and the average price per tray received on the Johannesburg market for the same two periods.

The figures from which these graphs were drawn show the changes which have occurred on the principal markets from 1937 to 1945, namely:—

- (a) The total number of trays sold per year has trebled.
- (b) The average price paid per tray has doubled, having increased from 1s. 5d., to 2s. 7d.
- (c) The main marketing period now extends from the middle of November to the end of February, having been lengthened by a month through fruit being marketed from the newly-developing warmer areas of the Lowveld. It would be desirable if a similar extension could be obtained at the end of the present mango season, either through planting late-maturing varieties or by cold-storing fruit at the height of the season and releasing this during March and April.
- (d) The peak of the marketing season is still from the middle of January to the beginning of February.
- (e) The lowest price per tray was received for the Kidney mango, while on the whole there was no significant difference between the prices received for Sabre and Peach varieties. However, some markets showed a decided preference in this respect, and in 1943 at Cape Town the Sabre commanded an average premium of 6d. per tray over the Peach.

Export.

Between the years 1926 to 1939 a total of some 13,000 trays of mangoes was exported to England, and the following is a summary of the Trade Commissioner's comments on all consignments.

- (a) Consignments of 1,000 trays at a time were in excess of the demand.
- (b) Small consignments of clean fruit in good condition received excellent prices, some up to 16s. per tray.
- (c) Very few consignments opened up in an attractive condition.
- (d) Fruit was usually picked immature and much opened green and flabby.
- (e) The use of individual wrappers is essential; unwrapped fruit was sweaty and sticky, showing much more black spot.

(f) Only fruit from Bordeaux-sprayed trees should be exported, and care should even then be taken that not a single fruit showing a sign of suspected anthracnose or black spot infection be packed. The abundance of infection on fruits was the greatest factor in the failure of many shipments.

(g) The fruit must be well-nested in woodwool, as lack of this resulted in fruit-rub and bruising.

(h) Not more than three trays should be wired together if this method is used, as handling difficulties are experienced with larger lots.

From the results of much work done at Kirkee in India and in Trinidad, certain fundamental factors affecting the successful cold storage of mangoes have been determined. All workers found that large varietal differences existed in the keeping quality; of 28 Indian varieties tested only 6 kept well in cold storage, the popular Alphonse being the best. The storage temperature for any variety should never be less than 45° F., but if fruit is immature it will chill at even this temperature. The stage of maturity at which the fruit is picked, is of the greatest importance in the resultant successful storage. The fruit must be fully developed and mature, but still green and hard. Stored at 45° to 48° F for 7 weeks such fruit later ripened fully at room temperature. The best temperatures for storing and ripening the dominant Sabre and Peach varieties in the Union will still have to be determined.

On account of the consignments of mangoes to England having been relatively small, it was necessary to include them in the holds together with other fruit. The carrying temperatures for these other fruits are 45° F. for pineapples, 40° F. for citrus, 38° F. for citrus and deciduous fruit, and 34° F. for deciduous fruit. Thus it is to be expected that in the past only those consignments of mangoes which were carried together with pineapples, would arrive in England free from the effects of chilling.

The potential export market for mangoes to India and the Far East should be fully explored, provided that ships sailing from Lourenco Marques can provide suitable cold chamber accommodation. Mangoes are in demand all the year round in India, and highly remunerative prices could be obtained for good quality mangoes during the Indian off-season, which coincides with the South African season. It would seem essential that some such market be established to absorb the expected tremendous increase in yield from the large-scale new plantings of mangoes in the lowveld when such trees come into full bearing. It is doubtful if the South African demand will absorb all this fruit at prices profitable to the grower, and the export market to England will for many years at least be restricted.

By-Products.

The nutritive value of the mango as compared with other tropical and subtropical fruits was found by Hall (1943) in Australia to be as follows: *Moisture*, 81 per cent.—average; *carbohydrates*, 16 per cent.—average; *acid*, 5 per cent.—medium; *protein*, 7 per cent.—low; *fat*, 2 per cent.—medium; *ash*, 5 per cent.—low; *vitamins*, A, B₁, B₂, C—high. The findings of other workers on the vitamin C content of the mango, for which property the fruit has been specially commended, have been confirmed at the Nelspruit Research Station. The concentration of vitamin C is a varietal characteristic, and ranges

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from 0.17 to 1.78 mgs. per gm. of pulp. Size of fruit, stage of ripeness after maturing, and locality in which grown do not appreciably affect the vitamin C value of any particular variety. Values of from 0.85 to 1.36 were found for the Sabre variety and 0.25 to 0.44 for the Peach. Of the imported varieties Jasmin gave 1.34 to 1.57, Paheri 0.29 to 0.42, Extrema 0.37 to 0.71, and Haden 0.26 to 0.31.

In India a considerable mango cannery and by-product industry has developed, while in Puerto Rico developments are taking place. The following are the requirements of a mango best suited for canning in slices: minimum fibre, hard and firm texture, intense yellow colour of flesh, high acid, high sugar content, and an agreeable aroma. Although South African canned mangoes have been put on the market, production is still in the trial stage, for, while the varieties available do not measure up to the ideal canning mango, a creditable product can be produced by variation of technique. Mango squash is also produced commercially in India, and the demand for this product is increasing rapidly as the public becomes acquainted with it. Some Indian manufacturers of orange squash add 5 per cent. mango squash to their product, thereby enhancing the colour of both the concentrate in the bottle and the resultant diluted drink. One canning company in the Union is producing a very fine mango chutney, for which the demand at present far exceeds the supply.

The mango can be utilized in many ways other than as fresh fruit by the housewife. Scott (1939) lists culinary recipes for the following: mango jelly, mango marmalade, mango preserves, mango sweet pickle, mango chutney, fried mangoes, mango ice-cream, and mango sundaes.

III(b).—Diseases and Pests.

Wager (1937) gave a comprehensive review of the diseases of the mango in South Africa with recommendations for their control. During the past two years, Dr. F. C. Loest, Plant Pathologist at the Nelspruit Station has been investigating further mango diseases and their control, adding considerably to the knowledge of this subject, and the recommendations given below are based on the results of this work. Great varietal differences in susceptibility to the main diseases have been found, and the future commercial potentialities of new improved mango varieties, while being determined in the first place by their cropping power, will be greatly influenced by the losses occurring through disease and the cost of disease control.

Tree Diseases.

The tree itself is relatively free from diseases. The paper-like scales found on young growth is caused by *Gloeosporium mangiferae*, but the extent and depth of the localized infection is not sufficient to girdle and cause death of such growth. Isolated cases of infection by the fungus *Physalospora perseae* on the trunks of young budded trees have caused severe gumming and death of portions of the trunk, but surgical treatment and increasing the vigour of the tree through fertilization have enabled such infected trees to recover. Anthracnose leaf spot caused by *Colletotrichum gloeosporioides* is found to be more prevalent on some varieties than on others during seasons favourable for the development of this fungus, but no appreciable loss or harm to the tree is caused. Bacterial black spot also occurs on the leaves, but seldom is the incidence severe.

Blossom and Fruit Diseases.

The following diseases of the blossom and fruit result in an appreciable loss of fruit every year.

Mildew.—When weather conditions during the blossoming period are hot and dry during the daytime, and heavy dews or mist occur nightly, the development of the fungus *Erysiphe cichoracearum* is favoured. The affected flower panicles, being covered with mildew, wither and die and in several areas, in seasons when the incidence is heavy, no crop has followed blossoming. This form of blossom blight must not be confused with the forms caused by anthracnose and brown rot fungus.

Brown Rot.—The term “brown rot” is applied here to a disease of mangoes not previously recorded, which Loest showed to be caused by the fungus *Physalospora perseae*. It is surmised that hitherto the damage has been regarded as being due to anthracnose. Starting in the flowers themselves the fungus progresses from the branchlets into the main central stalk of the inflorescence. Discoloured stalks with long and rather deep longitudinal black cracks are characteristics of the disease. Affected inflorescences have a blighted appearance, and this stage of the disease may also be termed blossom blight. Because the disease is systemic, fruits may be attacked when they are nearly set, assume a yellowish-brown or, later, brownish-black colour, and drop. This drop must not be confused with the drop of an unfertilized and consequently non-developing fruit. Through the action of this fungus, some varieties have been found to drop 90 per cent. of their normal fertilized fruits before they reach marble-size. Losses continue with some varieties right up to the time the fruit is fully formed. When the fungus develops in the fruit, having entered along the vascular bundles through the stalk, a brown rot imparting a leathery texture to the rind results.

Anthracnose or Ripe Rot.—This disease is caused by the universally-present fungus *Colletotrichum gloeosporioides* which is often also erroneously called “black spot”. Flower clusters may be attacked and destroyed in moist weather, but the greatest damage occurs on ripening fruits. Fruits are infected in the young stage as well as when mature, but the appearance of infection is delayed until maturity. Cracks or injuries on the skin of the developing fruit are points for easy infection. Infected areas increase rapidly in size, become black, and the flesh of the fruit softens and becomes discoloured, ultimate dropping of the fruit resulting. The fungus will continue developing on mature fruits which are only slightly infected at picking time, resulting in break-down before reaching the consumer. “Tearstaining” of fruit is also caused by this fungus.

Bacterial Black Spot.—This disease is caused by the bacterium *Bacterium mangiferae* and occurs only in South Africa, where it is most destructive. Black angular spots are produced on the leaves, and black gumming lesions and cracks on the stems; in wet seasons a serious fall of flowers and young fruits also occurs. Losses are due mainly to fruit being affected; brown spots, which rapidly turn black, exude gum and crack open, rendering the fruit unsightly and causing dropping when infection develops. Spread of the disease is rapid in rainy or moist seasons, the bacteria from old lesions or infected fruit being spread to healthy fruit through water drops, this being well

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shown by the streaky nature of infected areas on fruits. In dry seasons or areas the damage due to this disease is usually small.

Sooty Blotch.—Losses from superficial discoloration of the skin of fruit through growth of the sooty-blotch fungus *Gloeoides pomigena* are small, as the black "stain" can be wiped off with a wet cloth, but the work is laborious. Bleaching of fruit similar to the process used with citrus has been found effective.

Disease Control.

Due to the results of the later work of Loest in South Africa and of Ruehle (1944) in Florida, the recommendations of Wager for the control of mango diseases of the blossom and fruit in South Africa are modified, and are now as follows:—

(a) At least one dusting is made with a 50:50 sulphur-copper mixture at the height of the blossoming period. If the blossoming of an orchard is irregular and spread over a lengthy period, and if heavy rain falls soon after the first dusting, a second dusting should be given. Copper oxychloride, Bordeaux powder, or any proprietary copper fungicide are used as sources of copper in the dusting mixture. The sulphur controls the mildew and the copper both anthracnose and *Physalospora*.

(b) A first 6:6:100 Bordeaux spray is applied to the trees some three weeks after the blossoming is over and the fruit has reached pea to marble size. The addition of a good spreader to the spray mixture is essential.

(c) The second spray is applied when the fruit is half grown.

(d) Ruehle considers that most of the anthracnose infection has taken place by this time, and Loest has shown that brown rot infection is worst during the early stages of fruit development. However, Wager showed that further external infection of black spot and anthracnose can be controlled by Bordeaux spraying during the period from when the fruit is half-grown to maturity. The third Bordeaux spraying is given about three weeks to a month after the second, depending on weather conditions.

(e) A fourth spray should be applied when the fruit is fully-developed but some weeks before picking. It is during this period that black spot infection reduces the market value of so many fruits, especially if wet weather prevails.

For almost perfect control of mango diseases possibly ten dustings and sprayings at fortnightly intervals would be necessary in some years. However, the cost would be uneconomical. In some years it would not pay to apply even four sprays if the crop is very light. The blossom dusting or dustings should always be given. The number of later sprays must be determined by the individual grower who should take into consideration the crop set, the equipment available, and the weather conditions prevailing. Clean fruit will always realize good prices on the Union markets. If mangoes are to be exported, it will be essential that only healthy fruit be packed, for infection spreads after packing and the fruit will arrive overseas in an unsatisfactory condition.

Loest has found that copper dusts are just as efficacious as Bordeaux spraying in controlling diseases of the fruit. At present the

cost of copper dusting materials is such that spraying is more economical. However, when the cost of materials is reduced, it might be advisable to substitute dusting for spraying in the recommended control programme, as the cost of application is less with dusting than with spraying.

Mango Pests.

In South Africa there are as yet no pests of economic importance on the tree or fruit of the mango.

Mango Weevil.—In recent years nurserymen have found that mango seeds with husks which were planted for propagation purposes often failed to germinate. This failure is due largely to the presence of the mango weevil, *Cryptorhynchus mangiferae*, in the kernel of the seed. In 1944 up to 95 per cent. of seeds examined were infested on some farms. The adult beetle lays its egg in a slight incision in the skin of small green fruits, and usually the mature fruit does not show any sign of the presence or activity of the larvae which is feeding in the seed. This pest is considered serious in Madagascar, India, Ceylon and the Pacific Islands, affecting the appearance of the flesh of the fruit, inducing early ripening, and causing much fruit to fall prematurely.

No effective means of control is known. Sanitation is strongly recommended, all fallen fruits and seeds at the end of the harvest period being gathered up and burned. It is possible that a reduction of the incidence of black spot on young fruits will materially reduce the opportunities for the adult to find lesions in which to lay its eggs. Studies are under way on the life history of this insect, and a thorough knowledge of its behaviour and future possible importance in the Union should soon be available.

At present the main loss seems to be to nurserymen growing seedlings for direct sale or for propagation purposes. Careful counts have shown that Bordeaux spraying of trees for disease control also reduces the infestation of mango weevil by at least 50 per cent. In large-scale germination tests with infested and non-infested kernels removed from their husks the seedlings from the infested kernels were less vigorous than those from healthy seeds, while the number of seedlings produced from kernels which had been attacked by the weevil, was less than half that from non-infested kernels.

Fruit-flies.—The larvae of both the Mediterranean and the Natal fruit fly have been found in mango fruits in South Africa. However, no instances of the actual laying of eggs through the sound skin of the fruit have thus far been observed, as in Hawaii, although the writer has seen adults of the Natal fruit fly settle on sound maturing fruit on the tree. It seems that varietal differences in fruits determine the extent of such attack, and it may be that with the Peach and Sabre varieties these flies have oviposited only when there is a lesion or crack in the skin of the fruit, usually caused by anthracnose and black spot. This has then resulted in the development of larvae in the flesh of the fruit. Probably in such instances the fruit was in any case unfit for marketing and the fruit fly caused no additional loss.

Thrips.—During the past season it has been noticed in some orchards in the eastern Transvaal that the citrus thrips, *Scirtothrips*

THE MANGO IN SOUTH AFRICA.

aurantii, has caused a fair amount of fruit blemish on the Kidney and Sabre varieties of mango, while fruit on adjacent trees of the Peach variety was not attacked. It is not possible yet to say whether thrips on mangoes will require a control programme in the future.

Scales.—Eleven species of scale insects have been recorded on the mango in the Union. Of these, soft brown scale and circular purple are the commonest in occurrence. In the north-eastern Transvaal a greyish-white pear-shaped scale seems to be on the increase, particularly on the Sabre variety. Spot-spraying with an oil-emulsion is effective in controlling scale infestations on mangoes, and it is doubtful whether scales can be regarded as major pests. As Bordeaux spraying for disease control has not been practised to any extent yet, no observations on the build-up of scale, as is found in Florida following such continued sprayings, can be made.

Literature.

To aid in the preparation of this article some fifty references have been consulted. The following citations are only a portion of the literature available, and are given so that South African growers interested in further information regarding the mango may refer to them. Apologies are offered to overseas workers from whom information has been gathered and whose work has not been listed in detail.

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Nursery Quarantines.

The undermentioned nursery quarantines in force on 1 June 1947:—

- (1) Municipal Nursery, St. George's Park, Port Elizabeth, on privets, Bay, Ekebergias and Pecans (all) for red scale.
- (2) "Croc." Nurseries, Private Bag, Nelspruit, on citrus (all) for red scale.
- (3) Mooiuitsig-kwekery, Private Bag, Nelspruit, on citrus (all) for red scale.
- (4) H. L. Hall & Sons Ltd., Mataffin, on citrus (all) for red scale.

Agricultural Engineering:—*[Continued from page 603.]*

advisable in the case of large pumping projects to obtain the opinion of an engineer or to discuss the problem with a reliable firm of irrigation specialists, before purchasing pumping plant.

1 Morgen = 600 Cape sq. roods = $2\frac{1}{2}$ acres (nearly).

1 Acre = 43,560 Eng. sq. ft.

1 Acre inch of water = 1 inch depth of water over 1 acre = 23,000 gallons.

1 Three-inch watering per morgen = very roughly 150,000 gallons at field edge with a good system of irrigation where there is no unnecessary loss.

Area of a circle = $\pi \times \frac{D^2}{4}$ (or, πr^2).

$\pi = 3.14159$, or $\frac{22}{7}$ (approx.)

Volume of a cylinder = $\pi \times \frac{D^2}{4} \times L$, where L = effective length of cylinder.

1 Horse Power = 33,000 ft. pounds per minute.

1 cu. ft. = 1,728 cu. in.

Nursery Quarantines.

The undermentioned nurseries quarantines were in force on 1 July 1947:—

- (1) Mooiuitsig Kwekery, Private Bag Nelspruit, on citrus (all) for red scale.
- (2) English & Co., D.A., P.O. Box 150, Maritzburg, on citrus (part) for red scale and Strelitzias (part) and palms (part) for circular purple scale.
- (3) Ascheila Nursery, P.O. Hillary, on palms (part) for circular purple scale.

New Bulletins.

The undermentioned Bulletins have recently been published:—

Bulletin No. 260., Nutrition of Poultry, Price 6d.

Bulletin No. 264., Turkeys, Price 3d.

These Bulletins are obtainable from the Editor of Publications, Department of Agriculture, Pretoria.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26

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Price Review for May 1947.*

Fruit.—The markets were well supplied with guavas, avocados, pineapples and papaws which were disposed of at satisfactory prices. Oranges were offered in large quantities, but lemons and particularly grape-fruit were scarce. Apples, grapes and granadillas, however, were offered in moderate quantities.

Tomatoes.—Except for the Cape Town market which was well supplied, the supply of tomatoes decreased and prices, particularly in the case of tomatoes of good quality, showed an increase. On the Johannesburg market the prices of National Mark No. 1 tomatoes increased from 6s. 2d. to 7s. 4d. per tray, and ordinary tomatoes on the Durban market from 2s. 3d. to 2s. 5d. per tray. On the Cape Town market, however, the prices of ordinary tomatoes declined from 3s. 8d. per tray in April to 2s. 10d. per tray in May.

Potatoes.—Although the markets were still well supplied with potatoes, the supply, however, decreased, and prices increased appreciably. For example, on the Johannesburg market, the prices of Transvaal potatoes, Grade 1, increased from 11s. 5d. to 12s. 8d. per bag; those of Orange Free State potatoes on the Durban market from 11s. 7d. to 17s. 6d. per bag; and those of Cape potatoes on the Cape Town market from 15s. 3d. to 18s. per bag.

Onions.—Moderate quantities of onions were offered, and prices remained high throughout.

Vegetables.—The markets were well supplied with carrots, cabbage, cauliflower, beetroot and gem squashes, while good supplies of marrows and Hubbard squashes were also offered. Pumpkins

* All prices mentioned are averages.

however, were plentiful. Deliveries of green beans and cucumbers were limited and prices high, while green peas were also scarce and expensive.

Seed, Grain and Fodder.—This section was well supplied and price reductions took effect. Dry peas throughout were less plentiful and more expensive than dry beans.

Fodder.—Moderate quantities of lucerne, which were chiefly of poor quality, were disposed of satisfactorily. Large quantities of teff, which were of poor to medium quality, were sold at satisfactory prices, as well as good supplies of green grass and moderate deliveries of green lucerne.

Eggs and Poultry.—Eggs were offered in small quantities, and experienced a strong demand. Offerings of poultry on the Johannesburg market were quite insufficient to meet the particularly good demand, and high prices were realized.

Review of the Wool Market during May 1947.

During May 1947 a total of 35,675 bales of wool was offered for sale at auction in Union harbours, and 23,429 bales (65 per cent) were sold. This quantity was less than that offered in March and April 1947, while the prices for May were on a slightly lower level than those of April.

Lamb wool, shorts, bellies and free washing wool remained firm in value. There was no demand for karakul and coarse wool. Short wool was well supplied.

Index of Prices of Field Crops and Pastoral Products.

The above index, which appears elsewhere in this issue, increased from 205 during the previous month to 206 in May 1947.

The most important changes occurred in the following groups.

(a) "Other Field Crops", i.e. potatoes, onions, sweet potatoes and dry beans, show an increase from 169 to 187, particularly as a result of an increase in the prices of potatoes.

(b) "Hay" decreased from 176 to 166 due to a decrease in the prices of lucerne.

(c) "Pastoral Products" increased from 190 to 192 owing to a small increase in the prices of skins and wool.

(d) "Slaughter Stock" increased from 179 to 183 as a result of the increase in the producers' prices of mutton and pork.

(e) "Poultry and Poultry Products" show an increase from 283 during the previous month to 318 in May 1947 as a result of a further increase in the prices of eggs, fowls and turkeys.

Agricultural Conditions in the Union during May, 1947.

Weather Conditions.—Scattered showers of rain again occurred in all four provinces. Good rains fell particularly in the south-eastern Cape Province, and fairly good showers in the western and south-western Cape Province and also in the north-eastern and western Orange Free State. The western and northern Transvaal, as well as the lowveld however, had little rain.

Crops.—Generally the prospects for summer cereal crops appear to be promising. In Natal the sugar cane has shown a rapid improvement after the rain, and at present appears to be promising. In general the prospects for winter cereal crops also appear to be promising but are largely dependent on favourable climatic conditions later in the season.

Stock and Pastures.—The condition of stock and veld was still generally fair, but in some areas the veld required soaking rains to assure sufficient winter grazing. Except for lumpy skin disease and nagana which still occurred in Natal, stock diseases were quiet.

The Meat Control Scheme.

Special premium on slaughter stock.

ALTHOUGH a considerable number of cattle are generally marketed in May and June, there is at present a shortage due both to the drought in various parts of the country and to the outbreak of foot-and-mouth disease in Bechuanaland. Because supplies are necessary in June, the Meat Board has decided to pay a special premium over and above the usual seasonal increase in cattle prices, in the Witwatersrand, Pretoria, Durban and Pietermaritzburg areas, in order, as from 1 June 1947, to compensate producers sending stock to these areas.

A premium of 2s. per 100 lb. dressed weight will be paid from 1 June until 14 June 1947 to producers sending slaughter stock to the Witwatersrand and Pretoria, and 1s. per 100 lb. during the period 15 June to 21 June. In the case of slaughter stock sent to the Durban area, the premium will be 2s. per 100 lb. dressed weight from 1 June until 7 June and 1s. per 100 lb. from 8 June to 14 June 1947, while producers sending slaughter stock to Pietermaritzburg area will receive a premium of 1s. per 100 lb. dressed weight from 1 June to 7 June.

It is expected that there will be an improvement in the supply position after July.

Levy on Slaughter Animals.—The levy on slaughter animals, as imposed by the Meat Board since 14 February 1946, has been increased as from 25 April 1947 to reach the previous level, namely, in the case of cattle six months old from sixpence per head to two shillings per head, and in the case of sheep and goats from twopence to threepence per head. In respect of cattle under the age of six months, and pigs under or above the age of two months, the levy remains the same, viz. twopence, one shilling and threepence per animal, respectively.

Prices of Butter.

THE decline in the production figure for butter has resulted in an increase in the margin to butter manufacturers. Since the Government was not willing further to subsidise butter prices, it was decided to increase the wholesale and retail prices by 1d. per lb. in order to effect a partial reduction in the Government subsidy.

The maximum wholesale and retail prices of industrial butter are therefore as follows as from 1 June 1947:—

Wholesale price per lb.

	<i>Salted.</i>		<i>Unsalted.</i>	
First Grade	2s.	3d.	2s.	3½d.
Second Grade	2s.	1d.	2s.	1½d.
Third Grade	1s.	11d.	1s.	11½d.

Retail Price per lb.

First Grade	2s.	5d.	2s.	5d.
Second Grade	2s.	3d.	2s.	3d.
Third Grade	2s.	1d.	2s.	1d.

The maximum prices at which farm butter may be sold, was also increased by a further 1d. per lb., viz. to 2s. 7d. per lb.

The wholesale and retail prices of cheese, however, still remain unchanged, viz. as follows:—

Cheddar, Wholesale.—1s. 7d., 1s. 6d. and 1s. 4d. per lb. for 1st, 2nd and 3rd grade, respectively, for quantities of 12 lb. and more; and

Retail.—1s. 10d., 1s. 9d. and 1s. 7d. per lb.

Gouda, Wholesale.—1s. 7d., for 1st grade; and

Retail.—1s. 10d. for 1st grade.

The Prices of Wheat, Oats, Rye and Barley for the Season 1947/48.

IN order to enable producers to plan their production programme and to achieve the highest possible production, the Government, as in the past few seasons, again decided to announce in advance the producers' price of wheat and other winter cereals.

Wheat.—In a press statement issued on 9 May 1947 it was announced that the producers' price of wheat (i.e. basic price plus subsidy) was increased by 6d. per bag for the season 1947-48.

The producers' price for Grade 1, Class B wheat in bags will therefore be 41s. per bag as compared with 40s. 6d. per bag for the past season, with corresponding increases for the other classes and grades of wheat.

The higher price to the producer is granted in order to compensate producers for the increase in the production costs of wheat and also further to encourage the production of wheat.

Rye, Oats and Barley.—The basic producers' price of rye for the season 1947-48 was also increased by 6d. per bag for all grades in agreement with wheat prices, while the producers' prices for

CROPS AND MARKETS.

oats and barley remain unchanged for the season 1947-48. The producers' prices for the different grades and classes of winter cereals will therefore be as follows for the season 1947-48:—

	Class A.	Class B.	Class C.	Class D.
	s./d.	s./d.	s./d.	s./d.
<i>Rye.</i>				
Grade 1.....	27/6	—	—	—
Grade 2.....	27/	—	—	—
Grade 3.....	25/6	—	—	—
<i>Barley.</i>				
Grade 1.....	25/—	24/—	15/6	30/—
Grade 2.....	23/6	22/6	15/	29/—
Grade 3.....	22/6	22/	14/—	27/6
<i>Oats.</i>				
Grade 1.....	16/	15/6	—	—
Grade 2.....	15/6	15/—	—	—
Grade 3.....	—	14/	—	—

The above prices are f.o.r. per bag of 150 lb., except in the case of rye which is per bag of 200 lb.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannesburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.....	8/8	8/10	7/4	7/10	8/6	9/6	5/7	4/8	5/3
1939-40.....	6/8	9/10	7/3	9/11	9/8	10/5	5/7	5/9	5/0
1940-41.....	12/5	12/3	9/10	11/11	11/2	12/7	7/3	6/4	5/5
1941-42.....	10/5	13/11	10/4	13/10	13/0	14/3	9/10	7/1	8/4
1942-43.....	13/8	14/0	12/6	14/7	12/9	14/5	9/8	8/1	8/5
1943-44.....	16/2	18/9	15/1	17/4	19/1	19/2	12/0	10/9	10/7
1944-45.....	14/7	16/7	14/8	18/1	18/8	19/5	17/3	15/1	16/3
1946—									
January.....	12/0	12/1	9/7	—	11/7	13/0	17/1	15/6	17/3
February.....	12/3	13/8	11/1	13/1	15/2	9/11	17/3	10/3	17/2
March.....	11/4	12/4	9/9	12/10	12/9	13/5	18/5	14/8	14/8
April.....	12/1	12/10	11/3	13/10	15/1	14/9	15/2	17/4	14/7
May.....	13/6	13/9	11/9	13/9	12/10	14/7	15/8	15/6	14/5
June.....	14/7	15/5	12/2	17/1	15/11	14/11	14/11	14/8	15/1
July.....	11/10	14/3	12/0	15/0	15/2	15/6	15/2	15/2	17/4
August.....	14/9	17/0	13/7	15/10	20/6	18/7	16/10	16/0	18/3
September.....	20/9	25/3	20/4	23/2	21/5	23/3	20/0	16/5	22/11
October.....	24/9	28/1	32/5	24/0	32/3	31/8	24/6	16/9	20/10
November.....	21/11	—	26/11	—	24/8	21/1	23/10	15/1	20/8
December.....	16/8	15/2	12/4	—	19/8	19/6	18/11	11/11	25/5
1947—									
January.....	14/9	14/0	11/5	14/10	15/6	14/3	16/6	9/6	19/8
February.....	14/8	14/5	11/9	13/7	16/1	17/8	16/11	7/6	18/11
March.....	17/6	18/7	14/3	20/3	13/4	17/6	15/6	13/4	16/1
April.....	20/7	22/2	17/10	22/3	24/11	24/4	12/7	8/4	10/9
May.....	22/4	24/11	20/11	26/2	27/5	24/1	10/1	8/6	11/7

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johan- nesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (a).		
	Cape.	Trans- vaal.			K1.	K2.	Speckled Sugar	Cow- peas	Kid- ney.
1938-39.....	s. d. 3 10	s. d. 3 1	s. d. 4 0	s. d. 2 7	s. d. 13 1	s. d. 12 9	s. d. 25 0	s. d. 16 9	s. d. 24 2
1939-40.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.....	4 2	3 5	4 8	3 8	15 6	17 0	30 0	16 8	27 11
1941-42.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 8
1942-43.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.....	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.....	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1946—									
January.....	7 6	—	8 1	5 9	20 6	20 6	108 4	68 6	75 4
February.....	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March.....	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May.....	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June.....	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1947—									
January.....	5 10	5 11	7 5	3 8	48 9	48 9	61 4	38 11	51 4
February.....	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 3
March.....	6 3	5 10	7 5	3 11	40 8	40 8	47 1	35 1	49 3
April.....	7 1	6 10	7 8	4 7	38 4	38 4	55 7	42 3	56 1
May.....	6 8	7 6	7 9	4 6	33 5	33 5	50 8	38 2	50 0

(a) Municipal Market.

(b) Seasonal year for kaffircorn.
1 June-31 May.

Dry Beans, 1 April-31 March;

Lucerne and teff, 1 July-
June.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Combined index.
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)		
WRIGHTS.	19	13	2	3	34	6	17	6	100
1938-39.....	92	109	96	89	79	102	106	94	93
1939-40.....	86	114	77	95	115	105	106	89	104
1940-41.....	103	120	106	156	102	103	110	103	109
1941-42.....	120	144	143	203	102	131	135	136	124
1942-43.....	160	157	144	159	122	147	163	167	147
1943-44.....	170	186	137	212	122	154	185	188	159
1944-45.....	183	186	160	281	122	177	179	184	164
1945-46.....	201	194	164	312	118	198	185	170	170
1946—									
January.....	198	194	191	347	118	204	188	204	174
February.....	198	194	158	305	118	186	184	224	171
March.....	198	194	160	280	118	186	181	241	171
April.....	198	194	176	293	118	186	180	279	174
May.....	249	194	170	234	119	186	177	289	184
June.....	246	194	173	237	119	218	178	260	184
July.....	245	194	182	303	120	231	188	193	182
August.....	242	194	181	319	120	231	188	164	181
September.....	243	194	183	351	163	231	196	156	198
October.....	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December.....	242	210	157	236	168	194	208	201	200
1947—									
January.....	242	210	144	174	178	194	200	238	202
February.....	240	210	127	157	187	194	191	249	203
March.....	240	210	154	158	189	194	182	251	203
April.....	239	210	176	169	190	194	179	283	206
May.....	225	210	166	187	192	194	183	318	206

(e) Maize and kaffircorn.

(f) Wheat, oats and rye.

(g) Lucerne and teff hay.

(d) Potatoes, sweet potatoes,
onions and dried beans.

(e) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and
condensing milk.

(g) Cattle, sheep and pigs.

(h) Fowls, turkeys and s

CROPS AND MARKETS.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (a)		
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.
1938-39.....	s. d. 1 8	s. d. 2 3	s. d. 2 0	s. d. 2 4	s. d. 1 9	s. d. 1 2	s. d. 3 8	s. d. 2 6	s. d. 6 1
1940-41.....	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42.....	2 7	3 10	2 6	3 11	3 8	3 4	8 5	8 11	17 2
1942-43.....	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1943-44.....	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944-45.....	3 7	5 1	4 1	4 9	4 1	5 5	8 8	9 11	19 10
1945-46.....	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1946—									
January.....	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February.....	1 11	—	2 3	6 5	—	7 3	7 3	7 11	14 1
March.....	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.....	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May.....	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June.....	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July.....	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
August.....	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.....	5 0	6 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December.....	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January.....	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
February.....	4 2	—	5 1	3 2	—	5 8	10 4	—	12 8
March.....	3 5	—	2 8	5 3	—	7 5	16 8	20 0	24 5
April.....	2 7	2 5	2 1	6 7	5 1	7 5	13 4	4 11	27 1
May.....	3 2	3 3	2 5	9 0	4 0	4 8	8 10	18 8	23 8

(a) Weights of bags vary, but on the average are approximately as follows. —Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Prices of Avocados and Papaws on Municipal Markets.

SEASON	AVOCADOS (Per Tray). (a)				PAPAWS (b)							
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Eliza- beth Std. Box.	Bloem- fontein Std. Box.		
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.				
1938-39.....	s. d. 1 6	s. d. 0 11	s. d. 1 3	s. d. 1 11	s. d. 2 0	s. d. 0 10	s. d. 1 7	s. d. 2 0	s. d. 2 0	s. d. 1 8	s. d. 1 8	s. d. 1 8
1939-40.....	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6	1 6	1 6
1940-41.....	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9	1 9	1 9
1941-42.....	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0	2 0	2 0
1942-43.....	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0	2 0	2 0
1943-44.....	4 1	1 6	3 7	5 3	3 2	1 5	2 5	3 5	3 3	2 7	2 7	2 7
1944-45.....	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0	3 0	3 0
1946—												
January.....	3 1	1 8	5 10	9 2	3 10	1 6	4 5	7 11	6 4	3 11	3 11	3 11
February.....	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 6	4 7	4 7	4 7
March.....	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8	5 8	5 8
April.....	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6	4 6	4 6
May.....	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2	4 2	4 2
June.....	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0	4 0	4 0
July.....	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11	4 11	4 11
August.....	5 7	5 1	6 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4	4 4	4 4
September.....	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11	2 11	2 11
October.....	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10	1 10	1 10
November.....	8 6	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8	2 8	2 8
December.....	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6	2 6	2 6
1947—												
January.....	7 11	—	5 5	—	4 6	1 8	4 10	6 6	8 0	3 9	3 9	3 9
February.....	2 6	—	2 11	—	4 9	1 5	7 10	—	8 11	—	—	—
March.....	2 0	2 1	2 11	3 11	6 5	3 10	8 2	8 1	—	3 5	3 5	3 5
April.....	2 7	1 2	2 7	3 6	6 4	1 6	6 0	6 9	7 2	4 7	4 7	4 7
May.....	2 2	1 2	3 6	4 0	3 7	2 0	3 10	5 2	4 1	3 3	3 3	3 3

(a) Season 1 January to 31 December.

(b) Season 1 April to 31 March.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season 1 July to 30 June.	Johannesburg.			Durban.		Pretoria.	Cape Town.	
	Trans- vaal N.M. all classes. Grade I.	Transvaal.		Natal Ordinary No. I.	O.F.S. Ordinary No. I.	Trans- vaal N.M. classes. Grade I.	Cape Ordinary No. I.	Trans- vaal Ordinary No. I.
		Ordinary No. I.	Ordinary No. II.					
1938-39....	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40....	8 5	6 9	6 2	8 10	8 4	8 5	8 2	8 6
1940-41....	8 4	6 7	6 7	9 10	8 9	8 3	9 0	10 2
1941-42....	18 4	14 2	13 4	16 10	17 1	15 10	15 7	17 0
1942-43....	24 8	19 3	18 7	23 3	21 0	25 1	20 1	22 7
1943-44....	16 4	13 7	12 6	16 9	17 8	16 6	15 0	17 8
1944-45....	28 10	17 1	15 0	23 6	19 4	20 5	21 2	22 10
1944-45.... (a)	25 6	25 1	19 2	25 5	24 4	25 4	25 4	28 1
	Grade I.	Grade II.	Grade III.	Grade I. all classes.	Grade I. all classes.	Grade I.	Grade I. all classes.	Grade I. all classes.
1945-46....	30 11	24 11	15 9	28 9	29 8	29 6	30 11	30 7
1946—								
January..	34 8	30 9	19 5	34 1	—	35 8	31 6	—
February..	25 7	19 5	11 3	28 2	30 6	24 2	35 6	33 3
March....	23 9	18 3	11 7	26 3	25 11	24 0	29 8	29 5
April....	27 0	22 2	13 8	28 4	36 8	27 3	31 1	32 6
May.....	27 3	21 5	13 1	28 2	29 1	25 2	27 1	27 11
June.....	28 0	23 3	15 8	25 8	25 9	29 0	30 8	30 4
July....	28 8	23 11	16 2	31 11	32 0	31 3	31 5	32 10
August...	31 9	26 1	16 0	33 6	32 5	33 2	33 2	34 6
September	35 8	28 0	17 7	35 9	36 6	35 6	33 11	34 6
October...	36 3	29 2	20 11	36 10	37 2	33 11	34 6	—
November	26 10	23 5	16 0	33 9	33 10	24 8	28 11	—
December	18 11	16 0	12 1	26 6	29 9	19 6	19 4	—
1947—								
January..	12 4	9 0	6 5	15 1	—	11 8	15 6	15 1
February..	10 1	7 9	5 9	12 7	12 11	9 9	15 5	14 9
March....	9 6	7 2	5 10	14 0	9 10	9 7	12 9	13 5
April.....	11 5	8 2	6 3	12 10	11 7	11 10	15 3	13 11
May.....	12 8	9 10	7 4	17 8	17 6	12 8	18 0	14 7

(a) As from July 1945 compulsory grading was introduced on the nine controlled markets of the Union and the National Mark grades were abolished.

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[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

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Short Course in Domestic Science.

A short course in Domestic Science will be held at the Stellenbosch-Elsenburg College of Agriculture from 29 September to 3 October, 1947.

The following courses will be given:—

1. Domestic Science including cookery, upholstery, flower arrangement and interior decoration.
2. Spinning and Weaving Course.
3. Dressmaking Course.

The fee is 5s. per student and does not include accommodation. Students must arrange for their own accommodation.

N.B.—(1) All applications must be made to the Principal, S.E. Agricultural College, Stellenbosch.

(2) The number of students for the Spinning and Weaving course and the Dressmaking course is limited to 15 students each. Applications for the above-mentioned two courses must reach the Principal *before 12 September*.

(3) Railway concession certificates are available to students attending the course. Applications for certificates must be made to the Principal.

(4) Applications for the Domestic Science Course close 7 days before the course starts.

Further details in connection with the course and addresses of suitable places of accommodation will be forwarded on application.

Short Course in Beekeeping.

A short course in Beekeeping (English medium) will be held during the week 3 to 7 November 1947, at the Potchefstroom College of Agriculture. Application forms can be obtained on request from the Principal.

Hostel accommodation is limited and applicants should state whether they are prepared to secure their own accommodation in Potchefstroom, if necessary.

Fees: 30s. for resident students; 5s. for non-resident students.

Nursery Quarantines.

The following nursery quarantines were in force on 1 August 1947:—

1. Mooiuitsig-Kwekery, Private Bag Nelspruit, on citrus (all) for red scale.
2. Krohn's Nurseries, Preterita, on roses and ornamentals (part) for pernicious, red and Ross scales.
3. Smith's Nurseries, Johannesburg, on Citrus (all) for red scale.

FARMING IN SOUTH ... AFRICA

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August 1947

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Editorial :

Soil Conservation is Everybody's Business.

MAN is the product of what he eats, and what he eats comes from the soil. Human life depends on a continuous flow of the products of the soil, yet it is not merely the quantity of food grown, but also the quality that counts. Food produced from impoverished soil may be lacking in essential elements. The absence of these food constituents from the diet has been proved experimentally to produce nervous irritability, debility and general ill-health. Those suffering from vitamin or mineral deficiencies often display symptoms such as ill-temper, lack of vitality, loss of concentration, quarrelsomeness and unwillingness to co-operate.

In 1800 A.D. the human population of the world was 860 millions. By 1900 this figure had more than doubled. If the present very restricted rate of increase is maintained, the world's population may be 3,000,000,000 in 50 years' time.

The peoples of the world are clamouring for more and better food. One of the first jobs tackled by the recently formed World's Food and Agricultural Organization was to survey the world's food position. The result of this report gives cause for anxiety, for it is evident that agricultural production is inadequate to supply that sufficiency of the bounties of Nature to which every man, woman and child is entitled.

The gluts of certain foods which occur from time to time may engender the false impression that there is more food than can be consumed. These gluts are not caused by extensive overproduction, but by maldistribution and under-consumption. It is interesting to note that 90 per cent. of the world's food is consumed by the peoples of the countries in which the food is produced, and that only about 8 per cent. of the world's food reaches world markets. The tragedy of it all is that these small gluts cause disruptions and discontinuity of production because of inequitable prices received for farm products, in relation to the costs of production.

In spite of these very small gluts, the fact remains that although three quarters of the people of the world live on the land, half the world's population is underfed.

And now, after World War II, man has seen the crumbling of his social and economic structures, the jeopardizing of his trade and prosperity, and the wholesale destruction of his factories and industries. Mankind has been forced to see modern civilization in quite a different light, and the importance of agriculture and of the soil has been brought home to the hungry and cold millions of war-ravaged countries.

Never before has it been so clear that permanence and continuity are anchored to the soil.

Increased populations and greater demands on the world's limited food resources caused agriculturists the world over to attempt forcing the soil beyond its natural capacity. Impoverished soils result in decreased yields and poor quality food which, in turn, cause under-nourishment and ill health. The outcome of it all is high taxation for costly social and health services. There can be no social security without soil security.

All the world over the soil is failing. To-day man stands at bay, faced by increasing populations hungrily demanding more and more from over-worked and maltreated soils. The future of mankind depends on its ability to practise soil conservation and to devise means of proper distribution of the bounties of the soil.

The soil must become a growing and not a waning asset. If we in South Africa all help to conserve our soil, there will be inculcated in us a sense of security and permanence which is the secret of true prosperity and real happiness.

(E. D. Adler, Senior Publicity Officer, Division of Soil Conservation and Extension.)

The Groundnut-Seed Loan Scheme.

Conditions.—The Department of Agriculture has, in collaboration with the Director of Food Supplies and Distribution, arranged to make shelled, *untreated* groundnut seed available under the following loan scheme:—

Loans bearing four per cent. interest per annum, payable after one year, will be granted until 25 August, 1947 in respect of full-bag quantities of seed of not less than two bags and *not more* than 12 bags.

(a) Application for a loan, (b) memorandum of agreement and (c) receipt of seed forms are obtainable from magistrates of the districts to which this facility is *confined*, viz.:—

Transvaal.—Bethal, Lydenburg, Bronkhorstspuit, Groblersdal, Klerksdorp, Letaba, Lichtenburg, Middelburg, Nelspruit, Pietersburg, Potgietersrust, Potchefstroom, Pretoria, Ventersdorp, Waterberg and Zoutpansberg.

Natal.—Bergville, Dundee, Estcourt, Helpmekaar, Klipriver, Newcastle, Paulpietersburg, Umvoti, Utrecht, Vryheid and Weenen.

Orange Free State.—Bothaville, Hoopstad, Kroonstad and Vredefort.

Cape Province.—Taungs for Vaal-Hartz Irrigation area only.

Completed application, agreement and receipt forms, duly certified by an officer of the Department of Agriculture, co-operative society, or full-time Justice of the Peace, and *approved* by the Magistrate concerned, must reach the suppliers of loan-scheme seed at Nylstroom, Potgietersrust, Klerksdorp, Tadmester or the co-operative society at Lydenburg, Nelspruit, Bethal or Lichtenburg not later than 30 August, 1947.

The Production of Sunflowers.

J. Sellschop and J. J. du Toit, College of Agriculture, Potchefstroom.

In the past sunflowers (*Helianthus annuus L.*) were produced in the Union mainly as poultry feed and for ensiling. Large quantities of seed were also exported annually, especially to Australia and England. So, for example, during 1939 and 1940, respectively, 17,000 and 19,000 bags of 100 lb. each were exported to other countries.



FIG. 1.—A field of sunflowers in the Orange Free State.

[Photo: A. v.d. Riet]

Due to a world shortage of oil-bearing seeds, especially groundnuts, a strong demand for sunflower seed has arisen in recent years since this seed also contains a certain amount of oil. It can, however, be expected that the demand for sunflower seed will decrease as the cultivation of groundnuts increases, because the latter is more popular with most oil-expressers, since sunflower seed has to be decorticated at the factories. It is therefore unlikely that the attractive prices paid for sunflower seed during the 1946-7 season will be maintained at the same level in the future.

Climatic Requirements.

Sunflowers can be successfully grown wherever maize is generally produced. The crop is more drought-resistant than maize, and, although it cannot withstand severe frost, it tolerates light frosts better than maize. It can, therefore still be planted after it has become too late for maize.

Planting Season.

The planting season extends from September to the end of January, and planting may begin as soon as good rains fall and the danger of spells of late cold is past. As a rule, sunflowers are planted after the main crops such as maize or groundnuts have already been put in. Late plantings are also desirable, since the risk of serious eelworm (*Heterodera marioni* Cornu) injury to the roots of the plants is then smaller.

Soil and Fertilizer Requirements

The crop is not very fastidious as regards soil requirements. So, for instance, it does better than maize on relatively poor soil, and also on soil that is too alkaline for maize. For the best results, however, the crop prefers a fertile loamy soil.

In order to maintain sunflower-seed yields at a high level, it is advisable to apply from 200 to 400 lb. of superphosphate per morgen, either in the rows or broadcast. In the case of very poor soils, fertilizer mixtures containing small quantities of nitrogen and potash, e.g. mixtures C(2:12:2) and D(3:13:3), may be used at the rate of 200 to 400 lb. per morgen. As the potash content of sunflower stalks is generally very high, they are gathered and burnt in some countries in order to recover the potash they contain.

Rotation of Crops.

The general opinion is that sunflowers have a very exhaustive effect on the soil. The crop undoubtedly requires a considerable amount of potash, nitrogen and phosphorus, but there is little or no proof that it has a much more exhaustive effect than maize or teff for instance. On the contrary, there is experimental evidence that maize following sunflowers yielded more than maize following maize,* and that the yields of wheat after sunflowers were higher than those of wheat after maize†. The main reason why sunflowers should not be grown on the same land continually, is the danger of eelworm infestation. Apart from this, rotation will have the same advantages as in the case of maize.

Owing to the fact that sunflowers are highly susceptible to eelworm infestation without themselves showing ill effects, the choice of crops included in a rotational system with sunflowers calls for careful thought. It is for instance, not advisable for sunflowers either to be preceded or followed by any of the following: potatoes, tobacco, tomatoes, beans, pumpkins, cowpeas and soybeans, since these are also prone to eelworm infestation or the nematode disease. Maize, kaffircorn, groundnuts, or other crops which are highly resistant to eelworm, are more suitable for cultivation in rotation with sunflowers. Rhodesian experiments have shown that sunflowers are an excellent crop to precede groundnuts. Immediately after the heads have been harvested, the stalks should be razed by means of a weight dragged over them, and then ploughed in as soon as possible to allow decomposition to take place before the groundnuts are planted, so that there will be no medium on which the footrot fungus (*Sclerotium rolfsii* Sacc.) can multiply in areas where the fungus is troublesome.

Crop rotation and the ploughing in of stalks are also helpful practices in the control of certain sunflower diseases (e.g. *Septoria helianthi* Ell. and Kell.).

Soil Preparation and Methods of Planting.

For satisfactory yields the soil should be prepared as thoroughly for sunflowers as for other crops. On badly prepared lands it is, among other things, difficult to obtain an even stand and uniform development of the plants in order to facilitate harvesting.

For the uniform development and ripening of the plants it is essential that the spacing should be regular and that the plants should not occur in two's and three's. This can be effected by means of maize planters fitted with suitable plates in the seed hoppers. It

* Mandy, H. J. Sub-tropical Agriculture in South Africa (1923) p. 237.

† Leppan, H. & Bowman, G. J. Field Crops in South Africa (1923) p. 251.

THE PRODUCTION OF SUNFLOWERS.

is also desirable that the seed be graded according to size, before planting. The seed is then planted two to three inches deep in rows 3 feet apart, with a spacing of 12 to 18 inches in the row, the espacement depending on the specific variety grown and the climatic conditions prevailing in the area concerned. Where labour is available, the seeds may be planted fairly close together and the plants afterwards thinned in order to obtain a uniform spacing of 18 to 24 inches in the case of the giant varieties, and from 15 to 18 inches in the case of dwarf varieties. On lands against fairly steep slopes, the rows of sunflowers should be planted at right angles to the slope in order to restrict soil erosion, because sunflower plants do not protect the soil against erosion to the same extent as some other crops.

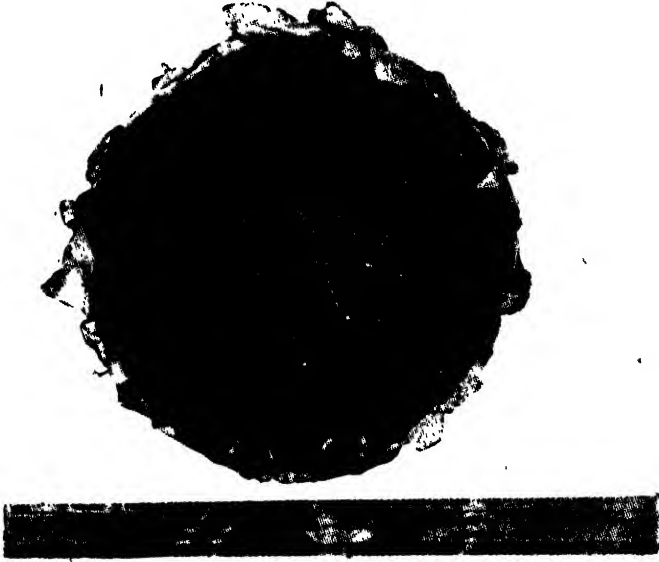


FIG. 2.—A head or flower of the semi-dwarf variety "Mars."

Approximately 15 to 20 lb. of sunflower seed is generally required per morgen. To prevent the transmission of seed-borne diseases, it is advisable to treat the seed with a suitable seed protectant just as is done with wheat and groundnuts. Seed protectants are usually advertised in the agricultural press and are also obtainable from agricultural co-operative societies.

Varieties.

The common sunflower with striped seed and the giant Russian variety with small black seeds are those which, up to the present, have been most widely grown in the Union. These varieties grow to a height of six feet and more and require a fairly long growing season of approximately 4½ months. Their heads are generally also large, viz., from 12 to 24 inches in diameter. Owing to the size of the plants and of the heads it is sometimes difficult to harvest the latter with combines. To overcome this difficulty, semi-dwarf varieties with certain desirable qualities have been developed abroad. Mars, Jupiter and Pole Star are three new semi-dwarf varieties which ripen within 100 days and grow to a height of 5 to 6 feet only. Their seed, too, has an oil content considerably higher than that of the old varieties. During the 1945-6 and 1946-7 seasons these imported varieties were tested out by the Potchefstroom College of

Agriculture at Potchefstroom and in co-operative experiments conducted on the Springbok Flats. It would appear that Mars and Jupiter are good early-maturing varieties which can be planted till late in January, and which, like the old varieties, are fairly drought resistant. Exact data as to their respective yielding capacities in comparison with the old varieties, are, however, not yet available. It is expected that seed will be advertised in agricultural journals after the 1948 season.* Attempts are also being made to import more seed of these semi-dwarf varieties as well as of the true dwarf varieties, such as Sunrise, Mennonite and others. The latter dwarf varieties grow to a height of 3 to 4 feet only and are, therefore, ideal for reaping with a combine.

Until such time as the seed of the dwarf varieties is available in sufficient quantities, the ordinary giant varieties bearing relatively small seeds may be used. Seed is usually obtainable from seed merchants, agricultural co-operative societies and advertisers in the agricultural press.

Seed Selection.

To improve a particular variety, it is advisable to set aside a certain portion of the sunflower land even before the plants start to flower and to apply strict selection to that portion by removing in good time all branching plants and those showing other undesirable qualities. Cross pollination takes place in sunflowers and different varieties should, therefore, not be planted near one another.

Cultivation.

Thorough weed control is as important with sunflowers as with maize. The first weeds should be harrowed down even before the seed is planted. As soon as the plants are up and well established, the land should be harrowed again. Careful cultivation with the harrow is practicable until the plants have reached a height of approximately 6 inches. Drastic harrowing should, however, be avoided. Cultivation between the rows should not be continued after the plants have reached a height of 18 inches since injured plants do not easily recover.

Harvesting.

Where sunflowers are grown on a large scale, combines have been used fairly generally of late for the harvesting of this crop. Some growers have managed to harvest even the tall-growing types successfully with combines, after having made certain adjustments to the machines. Other growers who could not successfully harvest the tall plants with their particular machines, have in turn developed a system by which the thoroughly dry sunflower heads are cut into baskets by means of pruning shears and carried to the combines. Each reaper's basket is suspended from his shoulders by a strong strap and the heads are then cut with the shears in such a way that they fall directly into the basket. Sickles are less suitable for this purpose. A gang of 20 to 25 reapers is generally required to keep pace with a combine.

Sunflowers can also be effectively threshed with an ordinary maize thresher. The heads are cut while their spongy backs are still fairly moist. In threshing, especially when the blower and the screenes are not properly adjusted, it is easier to obtain clean seeds when the heads still contain some moisture than when they are absolutely dry. Care should, however, be taken to ensure that the seed is not bagged while in too damp a condition. Seed intended for sale or storage should not contain more than 12½ per cent. moisture.

* Sunflower seed is, as a rule, not sold by experiment stations.

THE PRODUCTION OF SUNFLOWERS.

Where threshing machines are not available, sunflower seed can be beaten by hand or trampled by animals on a suitable threshing floor, and then be winnowed. A hammer mill may also be used for threshing the seed, provided screens with large holes are used and the machine is run at a slow speed.

The remaining spongy parts can be profitably used for feeding farm animals.

Yields and Marketing.

Approximately 20 to 25 bags (100 lb. each) of seed per morgen may be considered a fairly good yield.

As regards silage material, yields of 30 to 40 tons or more per morgen may be expected. The plants should be cut before they become too hard and fibrous. Sunflowers are best ensiled when approximately 20 per cent. of the plants are in flower. The green leaves of sunflowers can also be picked, dried and used as poultry feed. The protein content of the ground leaves is fairly high.

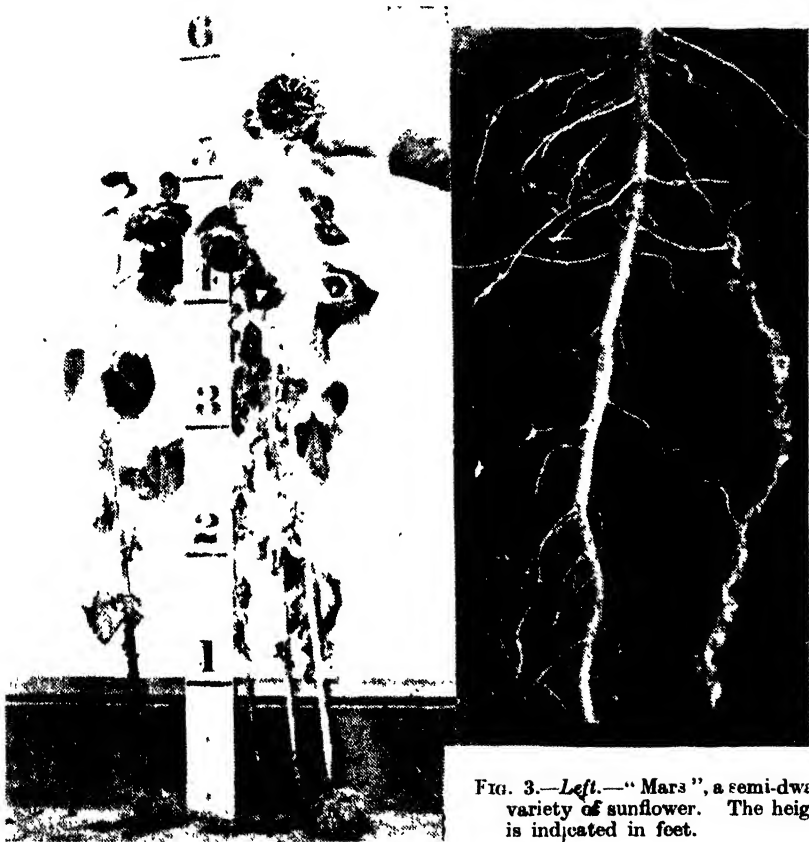


FIG. 3.—*Left*.—"Mars", a semi-dwarf variety of sunflower. The height is indicated in feet.

Right.—The illustration shows normal, clean roots next to knotty, thickened roots which have been caused by eelworm infestation.

The quality and grades of sunflower seed are determined mainly by the bushel weight and the percentage of foreign matter present. Hitherto sunflower seed has not been marketed under any scheme, but is usually sold direct to produce dealers and co-operative societies. Oil-expressers prefer to purchase large quantities from the latter instead of small quantities from numerous producers.

Winter Temperature and Fruit Yield.

Dr. G.D.B. de Villiers, Western Province Fruit Research Station, Stellenbosch.

THE fruit farmer in the western Cape Province has learned from experience that the yield of some kinds and varieties of fruit are influenced to a considerable extent by temperature conditions during the preceding winter. After mild winters the fruit crop is usually light, whereas after a cold winter, a good yield can usually be expected.

In the case of prunes, this fact has been proved by Reinecke (1936), who pointed out the close relationship between yield and the average maximum temperature from May to August. He also illustrated the relationship between the fruit yield in Franschhoek—which consists mainly of white-fleshed peaches, Japanese prunes and Bon Chrétien pears—and the same climatic element.

In connection with peaches, de Villiers (1940) pointed out the high correlation of -0.80 existing between the average temperature for June and July, and the yield of white-fleshed peaches in the western Cape Province.

Winter Temperature and Pear Production.

The fact that the winter temperature exerts an influence on the yield of prunes and peaches has therefore been proved. Since apples and pears generally require more cold during their dormant period—which is usually during the winter months of June and July—than most kinds of peaches and prunes, it follows that these fruits will also be adversely affected by unfavourable winter temperatures.

The extent to which apples and pears, in contrast with peaches and prunes, are affected by insufficient cold, varies pomologically. Perhaps this is due to the fact that in the former the fruit buds are borne mainly on shoots, whereas in the latter two kinds, they are borne mainly on spurs.

Whereas one of the most conspicuous signs of delayed foliation in peaches is excessive dropping of the fruit buds, resulting in poor flowering and consequently a poor crop, the drop of flower buds is much less conspicuous in apples and pears. The effects of delayed foliation on pomaceous fruit are apparently of a more cumulative nature, e.g. poor vigour and decreased production of fruit-bearing wood accompanied by a declining yield.

This difference, in conjunction with the fact that many pear varieties are strongly inclined to bear alternately or irregularly, is perhaps the reason why attempts in the past to correlate pear production with winter temperatures did not prove very successful.

Apart from poor pollination or incorrect methods of pruning, which may detrimentally influence the yield, irregular bearing is closely associated with the general vigour and nutrition of the tree. A heavy crop which makes considerable demands on the nutritional resources is, as a rule, followed by a lighter crop.

It stands to reason that these factors will have a strong bearing on seasonal fluctuations in pear production as a result of unfavourable winter temperatures, and this is probably the reason why unfavourable temperatures during the winter are sometimes followed by a poor pear crop.

WINTER TEMPERATURE AND FRUIT YIELD.

If a pear tree, however, grows in surroundings where it does not really thrive, and the vigour and food resources of the tree therefore leave much to be desired, the yield of the tree varies considerably in accordance with winter temperatures.

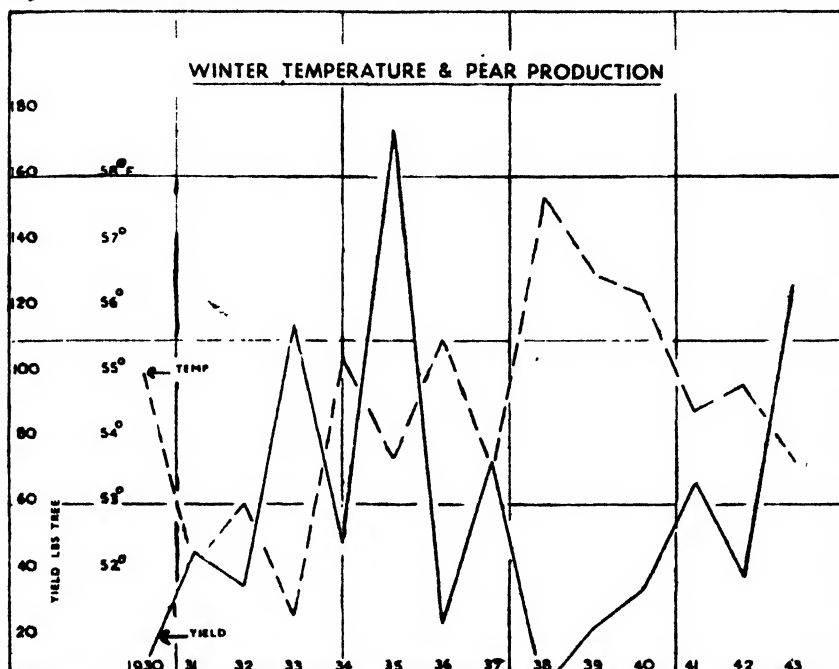


FIG. 1.—Winter Temperature and Pear Production.

This is illustrated in Figure 1. The data of the yield were derived from a pear orchard of 6,000 Beurre Bosc trees, situated in a comparatively low-lying locality (400 feet below sea-level) of the western Cape Province, and extend from 1930 when the trees were approximately 8 years old. The yield (in lb. per tree) was calculated and compared with the average winter temperature of Stellenbosch.

In figure 1 the relationship between winter temperature and pear yield is clearly shown. High winter temperatures during June and July resulted in poor yields. The contrast in the curves from 1938 to 1943 is particularly noticeable. A negative correlation of -0.60 which is fairly good if the fact is borne in mind that the data were derived from a limited number of trees, was determined between the yield and the winter temperature.

The yield curve also shows the inclination of Beurre Bosc to bear irregularly. The bumper crop of 1935, for instance, coincides with a winter temperature of nearly 54°F .—the critical margin of delayed foliation, but this crop followed on a very poor crop of the previous year.

This graph once again stresses the importance of winter temperature for the deciduous fruit tree. Cold during June and July is essential for sufficient rest. If the tree does not experience sufficient cold during these months, the familiar signs of delayed foliation which is usually accompanied by a poor yield will be evident when growth commences.

It has already been pointed out by de Villiers (1940) that the fluctuation of winter temperatures at Stellenbosch are indicative of

the varying temperature conditions in the fruit areas of the western Cape Province.

If the average temperature for June and July at Stellenbosch exceeds 54°F. , delayed foliation in peaches may be expected. It would appear from a close study of fig. 1, that this is also the case with Beurre Bosc pears grown under low-lying climatic conditions.

Years noted for delayed foliation, were 1934, 1936 and 1938, when the average winter temperatures were 55.2°F. , 55.5°F. , and 57.7°F. , respectively. The year 1938 was undoubtedly the worst in the history of delayed foliation in South Africa, and Peregrine peach trees at Stellenbosch bore practically no fruit.

Secular Fluctuation of Winter Climate.

Apart from big changes in climatic conditions, there are also smaller fluctuations of an irregular nature, known as secular changes of climate. Such fluctuations are also noticeable in the winter temperature of the western Cape Province, and are closely associated with the prosperity of the fruit industry.

Data of temperatures at Stellenbosch are available from 1926 and the average winter temperature for June and July is graphically illustrated in Figure 2.

The temperature fluctuations were equalized by means of Bloxam's formula, and are indicated by the broken curves.

From Fig. 2 it is evident that the winter temperature after the warm winters of round about the period 1926 to 1928, showed a tendency to drop until the lowest point was reached during 1931 to 1933. The latter years were characterized by cold winters followed by good yields. From then on the winter temperatures rose rapidly and reached the highest point round about the period 1938 to 1939.

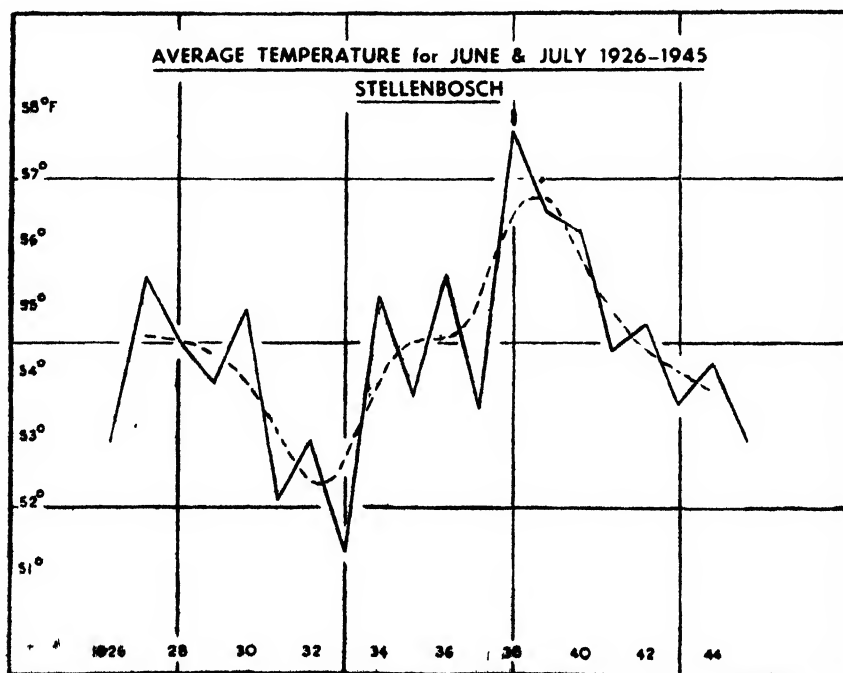


FIG. 2.—Average temperature for June and July : Stellenbosch, 1926—1945.

WINTER TEMPERATURE AND FRUIT YIELD.

No wonder therefore that the increasing complaints in connection with delayed foliation and poor yields since 1934, reached a climax in 1938.

In 1939, however, the climate pendulum began to swing back and a steady decline in winter temperatures was to be discerned, continuing until 1945. This downward trend in winter temperatures, again, was accompanied by a considerable improvement in yield.

The average winter temperature for Stellenbosch from 1926 to 1945 was 54.3°F. , and the standard deviation calculated according to the formula $\sigma = \sqrt{\frac{\sum x^2}{N}}$, was 1.5°F.

Winter Temperature Requirements of Fruit.

The lower the average temperature is during June and July, without danger of damage as a result of too low temperature or frost in the autumn or spring, the better the vigour and yield of the fruit tree will be. An average winter temperature of 45°F. should be a safeguard against serious frost damage in spring, and winter damage to the tree is then highly improbable.

On the other hand, if the average winter temperature exceeds 54°F. , susceptible varieties show the familiar signs of delayed foliation during the following growing season.

If it is assumed that the standard deviation from the average winter temperature in an area is 1.5°F. , or approximately 2°F. , then, strictly speaking, no deciduous fruit, except the grape, should be cultivated for commercial purposes in areas where the average winter temperature for June and July is above 52°F. If the average temperature is between 52°F. and 54°F. , susceptible varieties of fruit trees will be subject to delayed foliation in certain years.

The average temperature for Stellenbosch (54.3°F.) is very close to 54°F. The distribution of the temperatures is graphically represented in Fig. 3, which shows that over a period of 20 years, the temperature dropped to below 52°F. only once, rose to above 56°F. three times and remained between 52°F. and 54°F. , and 54°F. and 56°F. respectively, eight times. With the exception of a few favourably situated spots, the cultivation of deciduous fruit in the neighbourhood of Stellenbosch appears to be a risky economic undertaking.

Consequently, deciduous fruits may be successfully grown without any serious danger of winter damage, in areas where the average temperature for June and July varies from 45°F. to 52°F. At temperatures between 52°F. and 54°F. only fruits with a period of extremely light dormancy, or capable of resisting delayed foliation, such as the Kakamas peach, must be planted. The grape can be successfully cultivated even in areas with an average winter temperature of over 54°F.

The danger of frost damage when planting fruit trees which flower early, e.g. the almond, apricot and Japanese plum, in comparatively cold areas (eg. the Koue Bokkeveld), must be strongly emphasized here. Even in the case of peaches, orchards should rather be situated in areas which are comparatively free from frost.

The different kinds and varieties of deciduous fruit vary as regards the amount of cold they require during their dormant period. Generally speaking, the requirements of cold increase in the order of precedence given below:—grape, almond, apricot, Japanese plum, peach, pear and apple. Whereas the grape may be cultivated where the temperature during June and July is above 54°F. , apples require a temperature nearer the 45°F. mark.

An ideal grouping of our most important deciduous fruits according to regional temperatures for June and July, would be more or less as follows:

45° F.-56° F. : Grape.

45° F.-54° F. : Grape and almond.

45° F.-52° F. : Grape, almond, plum, apricot and peach.

45° F.-50° F. : Grape, almond, plum, apricot, peach and pear.

45° F.-48° F. : Grape, almond, plum, apricot, peach, pear and apple.

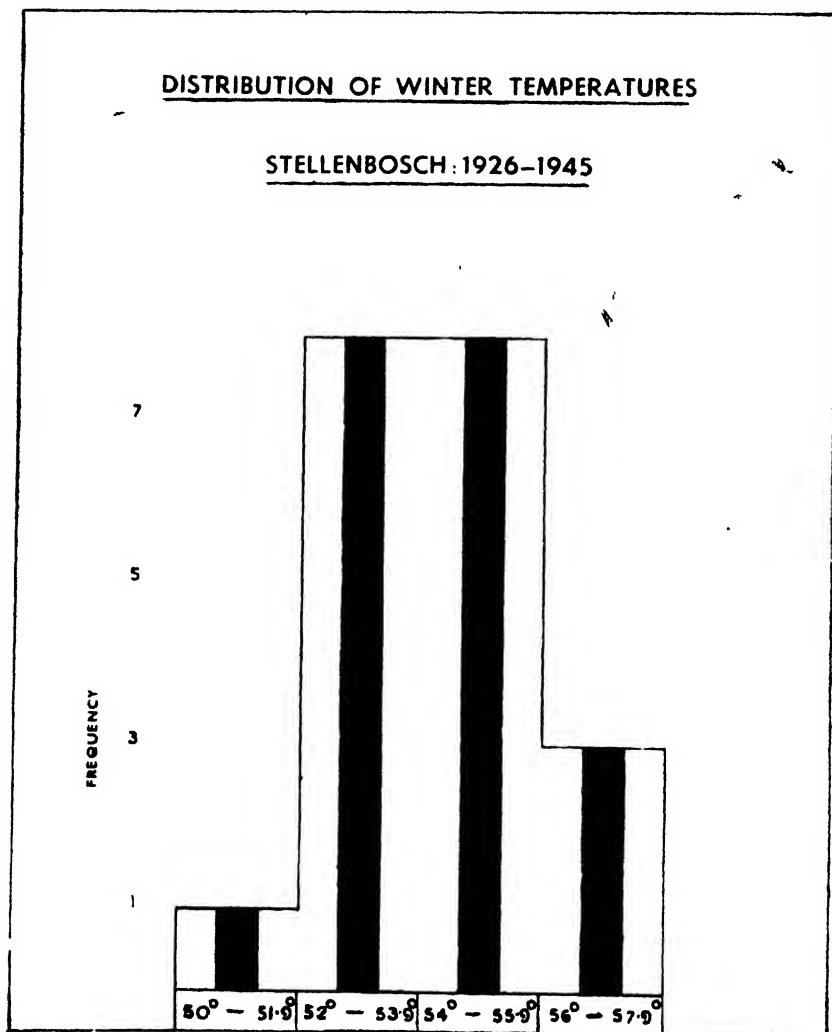


FIG. 3.—Distribution of winter temperatures: Stellenbosch, 1926—1945.

It must be strongly emphasized that even varieties of a particular kind of fruit may vary as regards their requirements of cold, and it is therefore possible to plant a peach variety requiring little cold, in an area where a peach variety requiring considerably more cold would not thrive.

WINTER TEMPERATURE AND FRUIT YIELD.

Note the requirements of cold of the following types and varieties of fruit:—

The average *apple* variety requires more cold during the dormant period than most varieties of other fruits. At least two months with an average temperature of below 48° F. is necessary.

The requirements of cold of such well-known varieties as Rome Beauty and Northern Spy are considerably higher than those of the Wealthy, Early McIntosh, White Winter Pearmain and Granny Smith varieties. On the other hand, Golden Delicious, Jonathan, Gravenstein, Cox's Orange Pippin, Red Astrachan, Ohenimuri, etc., require more cold than the latter types.

Most *pear* varieties require less cold than most apple varieties. While the Keiffer seems to require comparatively little cold, the other varieties show an ever-increasing demand for winter cold in the following order of precedence:—Forelle, Anjou, Packham's Triumph, Louise Bonne, Winter Nelis, Comice, Beurre Bosc, Beurre Hardy, Glou Morceau and Bon Chrétien.

It is interesting to note that of the abovementioned varieties the most popular variety for drying, preserving and dessert purposes, the Bon Chrétien requires the most cold.

Of the peach varieties, the Kakamas, cultivated mainly for canning purposes, is considered to be particularly resistant to delayed foliation. Of the dessert varieties, Early Dawn is fairly resistant. Inkoos en Pucelle show signs of susceptibility, whereas the Peregrine and Elberta are beyond a doubt susceptible. The Muir, Tuscan and Phillips are particularly subject to delayed foliation.

Both the Babcock and the C. O. Smith, as well as the new Boland peach are considered to be fairly resistant to delayed foliation.

The *Japanese plum* is particularly moderate as regards its cold requirements. Methley is considered to be generally resistant to delayed foliation, whereas Kelsey, Santa Rosa, Satsuma, Gaviota, Wickson and Burbank, in the above order, show an increasing need for cold.

TABLE I.—*Winter temperature of fruit areas in the western Cape Province. June and July.*

		°F.
<i>Group I.</i>		
Average Temperature.....		45—50
(i) Koue Bokkeveld.....		46·4
(ii) The Koo.....		(47)
(iii) Ceres.....		49·4
(iv) Elgin.....		49·8
<i>Group II.</i>		
Average Temperature.....		50—52
(i) Montagu.....		51·8
(ii) Banhoek.....		51·9
<i>Group III.</i>		
Average Temperature.....		52—54
(i) Hex River Valley.....		52·9
(ii) Wolseley-Tulbagh.....		53·4
(iii) Franschhoek.....		53·4
(iv) Worcester-Robertson.....		53·5
(v) Groot Drakenstein.....		53·8
<i>Group IV.</i>		
Average Temperature.....		54—56
(i) Somerset West.....		54·3
(ii) Stellenbosch.....		54·4
(iv) Wellington-Paarl.....		54·7
(iv) Groot Constantia.....		55·8

Generally speaking, the European plum requires more cold than the Japanese plum. The cold requirements of the President and Diamond are perhaps smaller than those of the D'Agen, which requires a little more cold than the Elberta peach.

Whereas the *apricot* requires less cold than most apple, pear, peach and European plum varieties, the *almond* requires the least cold of all the abovementioned fruit varieties.

A Macro-Climatological Survey of the Winter Temperature of the Principal Fruit-Producing Areas in the Western Cape Province.

The temperature conditions prevailing in the principal fruit-producing areas of the western Cape Province are indicated in table 1, and graphically represented in Figure 4.

From these data it can clearly be seen that the Koue Bokkeveld, the Koo, Ceres and Elgin fulfil all the cold requirements. As regards winter temperature, the abovementioned areas are, therefore, the most suitable for the cultivation of apples and pears which require considerable cold during their dormant period.

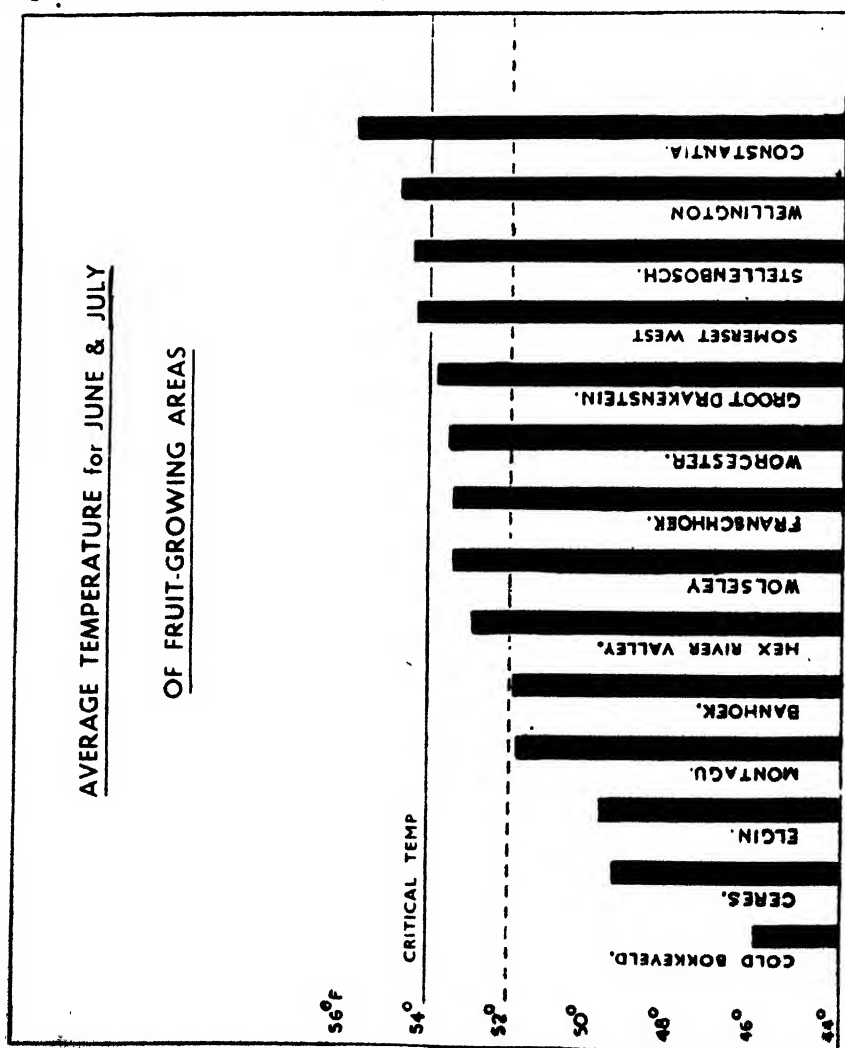


FIG. 4.—Average temperature for June and July in the fruit areas of the western Cape Province.

Deciduous Fruit Varieties for the Western Cape Province.

Dr. M. W. Black, W.P. Fruit Research Station, Stellenbosch.

THE success of fruit farming in the western Cape Province depends very largely on the correct choice of varieties for the orchard. The variety, more than anything else, determines the yield per tree, the quality of the crop, and the suitability of the fruit for marketing.



FIG. 1.—“Delayed foliation” of the peach.—Left: Highly resistant variety; Right: Very susceptible variety.

When deciding on varieties for the orchard, there are two main requirements to be met, namely that the variety should possess the necessary market or sale value and that it should be suited to the environment in which it is grown, especially the climate and the soil.

Commercial Value.

The commercial value of a variety is very closely bound up with the purpose for which it is ultimately used.

There are three main outlets for fruit in South Africa to-day, viz. the fresh fruit market (including export), factory processing (canned fruit, jam, pulp, etc.), and drying.

Regarding fresh fruit production the prospects appear to be distinctly good. To-day, with the resumption of export, the greatly increased demand for fruit on the local markets and the large proportion of the crop which goes to the factories, there is virtually no surplus problem with dessert fruit. In fact, there is rather the danger of an acute shortage of certain fruits, e.g. peaches, apples, pears, etc.

From the marketing angle, there is much scope for the expansion in the dessert line. On the other hand, it should be borne in mind that at present suitable land for large-scale planting is extremely limited in most of the areas which are suited to dessert-fruit production. The emphasis should rather be on the improvement of existing plantings by eliminating or replacing marginal orchards and unprofitable varieties.

Dessert-fruit production will always play an important, perhaps the major rôle, in the erstwhile "export" areas, where land values are comparatively high and the average farm limited in size, e.g. Franschhoek, Groot Drakenstein, Paarl, Ceres, etc.

Dessert-fruit production is the most intensive type of fruit farming, requiring specialized labour and expert supervision, and fits in best with the facilities and economic structure of the old established fruit areas which specialized in export before the war.

The main problem to-day is the shortage of skilled labour, especially during the packing season. The industry is rapidly approaching a crisis in this respect and growers will have to consider seriously the question of pooling their resources and starting co-operative packhouses wherever such are practicable. At present co-operative packing is almost non-existent in the deciduous fruit industry.

Canning.

The most significant feature of the fruit industry in the western Cape Province has been the rapid rise of the canning and jam-making industries. Before the war, processing factories operated on a very limited scale; to-day the number of factory units and the output have increased to such an extent that processing has become a major branch of the fruit industry in the western Cape Province. There is apparently, to-day, a greater shortage of fruit suitable for canning and jam-making than of dessert fruit, and canners are encouraging growers to plant more fruit for the factory, especially apricots, clingstone peaches, Bon Chretien pears, Satsuma plums, figs and berries.

At the moment the prospects for "tinned" fruit are exceptionally good, especially as the overseas market is, and will for some time be, undersupplied. How long these conditions will hold, is of course difficult to say.

Although there is definite scope for further expansion of the processing industry, planting should not be done indiscriminately, but only suitable varieties grown under conditions that favour a high production per acre. This would be the best safeguard against the effects of any undue competition on the world market in the future.

Growing fruit for the factory (except in the case of berries) is a more extensive type of fruit farming than dessert-fruit production due to the fact that the price paid by the canner is lower than the return on the fresh market, although this is partly offset by the lower production and marketing costs of the former.

Where a variety of fruits ripening in sequence is required for dessert production, two or three lines of fruit grown on productive soil under irrigation and giving a high yield (5-10 tons) per acre are here required. This type of fruit growing is not so well suited to the intensive farming conditions of the old "export" areas, and it would seem that inland areas where larger tracts of irrigable land are available, such as Worcester, Robertson, Villiersdorp, Tulbagh, Wolseley and the Little Karoo, offer greater possibilities for large-scale production of fruit for the factory. Growing fruit for the factory should, in future, form a profitable side-line to the stable wine industry in the more inland wine and raisin-grape areas. Royal apricots, Kakamas peaches and White Genoa figs especially would fit in well in these parts.

Drying.

With the exception of prunes, the production of dried tree-fruits has not made much headway in recent years, and with some fruits, e.g. apricots, has even retrogressed. This is largely due to the labour shortage on the farm, improved transport facilities, and the greater demand for fruit by the canners, even for culls which normally would have been dried. Prunes offer by far the best possibilities for dried-fruit production, but then only in climatically suitable areas. Royal apricots can always be used as a dual purpose fruit for either the factory or the drying yard. Relatively few peaches will be planted solely for the purpose of drying, but possibly when more clingstone peaches become available for the factories, a large proportion of the Elbertas that are to-day canned, will be used for drying.

In the warmer inland areas figs also offer good prospects for drying.

Soil and Climate.

Climate and soil largely determine the kind and variety of fruit that can be grown on the farm.

All fruit trees require well-drained soil of a depth varying from 3 to 5 feet—the deeper the soil, the better. Good drainage especially is all-important, as fruit trees will not tolerate water-logged conditions. The soil must also be sufficiently retentive of moisture in summer, especially for the later-maturing varieties. In areas with an annual rainfall of less than 20-25 inches, all fruits must be irrigated. In the higher-rainfall areas, apricots and the earliest maturing peaches and plums can generally be grown successfully without irrigation, provided the soil has adequate depth. In exceptionally dry seasons, however, these fruits will benefit materially from one or two timely irrigations. Apricots require relatively less moisture than other deciduous fruits and are generally planted out on the more sandy gravelly soils. Pears, on the other hand, do well on the heavier and more clayey types of soil, a clay loam being the best. Other fruits are grown mostly on the intermediate sandy loam and loamy soils. Although growth and production can be stimulated by a sound manurial programme, deep soils that are naturally fertile always give the highest yield.

Although the value of good well-drained soils cannot be over-estimated, climate plays a relatively more important rôle in South Africa.

Of all the fruit-growing regions in this country, the western Cape Province is the most richly endowed with natural advantages for deciduous fruits. Its one great disability, however, is the frequent occurrence of mild winters giving rise to low and irregular yields.

All deciduous fruit trees require a measure of cold during their winter rest*, and when this is insufficient they develop an abnormal condition commonly known as "delayed foliation". "Delayed foliation" manifests itself in a delayed and protracted blooming period, an excessive shedding of flowers and newly set fruit, and low yields. Especially with peaches, apricots and plums the position is aggravated by the shedding of a large part of the flower buds prior to blossoming, resulting in a poverty of blossoms. Apart from the abnormal blooming period, foliation on the tree is also irregular and delayed. Trees suffering from "delayed foliation" show the typical "bare neck" appearance, i.e. growth takes place at the tip of a dormant shoot and also near its base, leaving a bare stretch in between. In severe cases growth at the tips may be lacking or so delayed that die-back eventually occurs.

Watershoots and other succulent growth generally arise in profusion from the trunk and older parts of the tree, and tend to mask the "bare necks" or dry tips later in the season. The serious part of this abnormal foliation lies in the fact that many of the buds on the one-year-old wood remain dormant and fail to form fruiting wood for the next year's crop. Furthermore, the lack of sufficient growth on the younger parts of the tree may lead to sunburn, die-back and to the dwarfing of the tree. An attempt has been made by de Villiers* to group the various fruit-growing areas in the western Cape Province into certain main climatic zones according to winter temperatures.

The coldest zone (average minimum temperature for June and July below 40° F.) comprises the areas of high altitude, e.g. Cold Bokkeveld, Ceres, Koo, Elgin, etc.

From the point of view of "delayed foliation" this zone is the most suitable for deciduous fruit in general. The mildest zone (average minimum winter temperature above 44° F.) is represented by the coastal and low-lying regions such as Constantia, Somerset West, Stellenbosch, Paarl, etc., and is very subject to "delayed foliation". Here in general the vine is far more at home than deciduous fruit trees are.

Areas like Banhoek, Franschhoek, Worcester, Groot Drakenstein, Tulbagh, Wolseley, etc., fall more or less within the intermediate zone.

It should be born in mind that, within each of these arbitrary zones, variations in geographical and climatic features occur, resulting in similar variations in "delayed foliation". Even the actual site of the orchard on the farm may make a big difference; for example, a southerly aspect less exposed to the winter sun would be less subject to "delayed foliation" than an exposure to the north.

Apart from variations in climate between areas, the different kinds and varieties of deciduous fruits exhibit marked differences in susceptibility to "delayed foliation".

* See article elsewhere in this issue, entitled "Winter Temperatures and Fruit Yields", G. D. B. de Villiers.

Some varieties, unfortunately very limited in number, are highly resistant to the trouble and could be grown successfully in the mild coastal section. Others again frequently show symptoms of "delayed foliation" even in the coldest localities. Of course, winter temperatures are not the only climatic factor influencing yield and quality. Rainfall or amount of available water is in some localities of greater significance, whereas with some kinds and varieties factors such as spring frost, wind, humidity, summer temperatures, etc., may be the limiting conditions in certain areas. All the various climatic factors jointly affect the tree, and the only way to determine the adaptability of a variety to a locality is by long experience or experimentation.



FIG. 2.—Bon Chretien pear branch showing "delayed foliation". Note the "bare neck" appearance of the branch.

As "delayed foliation" is, however, the most important climatic problem in the western Cape Province, first consideration should be given to this question before the grower decides on what varieties to grow.

Varieties.

Peaches and Nectarines.—Of all deciduous fruits, peaches and nectarines have perhaps been planted the most indiscriminately both in regard to varieties and to site.

* DE VILLIERS, G. D. B. "Influence of Climate upon Fruit Production" *Farming in South Africa*, June 1943.

TABLE I.—*Peach and Nectarine Varieties.*

A.—WHITE-FLESH VARIETIES: FREESTONE OR SEMI-FREESTONE TYPE.

Variety.	Average harvesting season.	Commercial value.	Resistance to "delayed foliation".	Suggested areas where variety should prove economical.
Early Dawn..	End of November—early December	<i>Dessert</i> : quality fair. Suitable for export and local markets	Highly resistant..	Banhoeck, Franschhoek, Gt. Drakenstein, Paarl, Stellenbosch, Wellington, Wolsley.
Inkooe.....	Early December—late December	<i>Dessert</i> : quality good. Suitable for export and local markets	Fairly resistant....	Ceres, Elgin, Banhoeck, Franschhoek, Groot Drakenstein, Wolsley.
Duke of York.	Middle December—beginning January	<i>Dessert</i> : Excellent quality. Suitable for export and local markets. Great demand on local markets	Very susceptible..	Ceres Warm Bokkeveld.
Poland.....	Late December—early January	<i>Dessert</i> : Good size and quality. Shows great promise for export and local markets	Highly resistant..	Stellenbosch, Paarl, Wellington, Wolsley, Franschhoek, Banhoeck, Elgin, Ceres, Warm Bokkeveld and coastal areas.
Peregrine.....	Beginning January—late January	<i>Dessert</i> : Outstanding quality. Very suitable for export and local markets	Fairly susceptible.	Ceres Warm Bokkeveld, Elgin.
Babcock.....	Middle January—end of January	<i>Dessert</i> : Good colour, very sweet, poor size. Suitable for local markets	Highly resistant..	Stellenbosch, Paarl, Wellington, Groot Drakenstein and other coastal areas.

B.—YELLOW-FLESH VARIETIES: FREESTONE.

Hibertia.....	Middle January—middle February	<i>Dessert</i> : Good size and quality. Very suitable for local markets, fair for export <i>Drying</i> : Good quality <i>Canning</i> : Fair quality	Moderately susceptible	Ceres Warm and Cold Bokkeveld, Elgin, Banhoeck, Franschhoek, Worcester, Robertson, Montagu, Koo, Villiersdorp, Groot Drakenstein, Little Karroo.
Muir.....	Middle January—middle February	<i>Drying</i> : Excellent quality	Very susceptible..	Ceres Warm and Cold Bokkeveld, and outlying Karroo areas of high altitude.

C.—YELLOW-FLESH: CLINGSTONE.

Kakamas... ..	Late February—early March	<i>Canning</i> : Excellent quality	Highly resistant.	All areas with irrigation facilities, especially Worcester, Hex River Valley, Robertson, Montagu, Villiersdorp, Tulbagh, Little Karroo.
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D.—NECTARINE: FREESTONE, WHITE FLESH.

Goldmine.....	Beginning January—late January	<i>Dessert</i> : Good quality, suitable for export and local markets <i>Drying</i> : Quality good	Moderately resistant	Ceres Warm Bokkeveld, Elgin, Banhoeck, Franschhoek, Tulbagh (Winterhoek locality).
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A survey in 1927 showed that an assortment of about 70 varieties was at that time being grown in the western Cape Province. It stands to reason that a large proportion of these varieties were ill adapted to local growing conditions and had in course of time to

be removed or replaced. Hence it is no surprise that there are to-day less than a dozen varieties that are grown on anything like a commercial scale. As the peach is very subject to "delayed foliation", some of the low-lying coastal areas, such as Constantia and Somerset West, were by force of circumstances eliminated as peach-growing centres.

Nevertheless, the adaptation of the variety to the climate still remains the main problem of the peach industry, and in most districts many uneconomical varieties are still being grown. The question of varieties is thus of singular importance to the peach and nectarine grower. The fact that many growers have had disappointing experiences in the past with peaches, due to low yields, has caused many of them to go in for other lines of fruit production. The net result is that an acute shortage of this important dessert fruit faces the industry to-day. From the marketing standpoint, it is essential that in the near future production be stepped up as much as possible. The prospects for future expansion of dessert-peach production are thus very bright, provided that only commercial varieties suited to the climate of the particular locality are grown. As has been indicated, there is also scope for further expansion in the processing line.



FIG. 3.—Bon Chretien branch showing normal growth (compare with fig. 2). Note the amount of growth and the number of spurs that have developed.

In Table I particulars are given of the more important varieties of peaches and nectarines grown in the western Cape Province.

In the suggestions put forward regarding the areas where each variety could best be grown, consideration has been given to the

climate as well as to other geographical and economic features of the area.

For instance, Babcock, although climatically suited, is not recommended for the "high altitude" areas such as Elgin and Ceres, because the better commercial Peregrine variety would be more economical there.

Plums.—There are two main groups of plums grown commercially in the western Cape Province, viz. Japanese plums which are used mainly for dessert purposes and to a limited extent for processing, and European plums, some varieties of which are pre-eminently suitable for prune drying, while others again are dessert varieties.

As a class, Japanese plums have adapted themselves better to climatic conditions in the western Cape Province, than European plums. With the exception of a few varieties, they are also far less susceptible to "delayed foliation". Japanese plums are found in all the fruit-growing areas of the western Cape Province, the only exceptions being localities where spring frosts constitute a menace. Due to economical considerations most of the commercial plantings, however, occur in the coastal and intermediate regions.

Satsuma is the most suitable Japanese plum variety for processing purposes, especially for jam-making, and some of the factories are strongly recommending growers to plant this variety. Unfortunately Satsuma is not a consistently heavy bearer under western Cape Province conditions. In this respect it compares rather unfavourably with the standard dessert varieties such as Santa Rosa and Kelsey. The reason for this irregularity in bearing is partly, but not wholly, due to "delayed foliation".

It would seem that in certain localities outside the winter-rain-fall belt, e.g. George, the Satsuma generally does better. The advisability of planting Satsumas in the western Cape Province would thus depend largely on the future price that the processing trade is prepared to pay for this variety.

The prune d'Agen is the outstanding European plum in the western Cape Province. This variety, being very subject to "delayed foliation", should be grown only in the higher inland areas, e.g. Ceres Warm and Cold Bokkeveld, Koo and also in the Winterhoek and Roodesand localities of Tulbagh. The last-mentioned, due to their sheltered position, enjoy a climate quite distinct from the rest of the Tulbagh-Wolseley district.

The Sugar prune, another drying variety, has latterly been attracting considerable attention. Most of the plantings are still very young so that it is difficult to say how well this variety will adapt itself to climatic conditions in the western Cape Province. General observations show the Sugar prune to be somewhat less susceptible to "delayed foliation" than the Prune d'Agen. On the other hand its commercial value as a dried fruit does not reach the high standard of Prune d'Agen. It is very doubtful whether the Sugar prune will ever displace the Prune d'Agen in areas where the climate is suitable for the latter variety.

Of late, a few promising dessert European plums have come to the fore, e.g. President and Burbank's Giant Prune. These varieties should be of particular value for the export market.

In Table II, details are given of the more important Japanese and European plums recommended for the western Cape Province. As with peaches, the suggestions regarding areas have not been based on the incidence of "delayed foliation" alone, but also on other climatic and economic factors.

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Apricots.—Although the apricot generally does not require as much winter cold as most other deciduous fruits, it nevertheless is affected by high winter temperatures. After mild winters it is inclined to shed an excessive number of fruit buds, resulting in low yields. The tree is also very sensitive to fluctuating weather conditions during its blooming period, with the result that in all areas yields are subject to seasonal variations. On the other hand, the apricot is to-day the most popular processing fruit, and is in great demand with canners. It is also extensively used for drying purposes. The tree is not as fastidious regarding soil requirements as most other fruits, and in areas with a rainfall of 25 inches and over is grown successfully without irrigation.

In the past, Wellington was the premier apricot district in the western Cape Province, but due to soil exhaustion and the fact that many of the trees have reached the end of their economic life, it is rapidly being displaced by areas like Tulbagh, Wolseley, Worcester, Robertson and the Little Karroo.

Apricots can be grown in all parts of the western Cape Province, except the extreme coastal regions and the coldest inland areas where spring frosts constitute a danger.

TABLE II.—*Plum varieties.**

Variety.	Average harvesting season.	Commercial value.	Resistance to "delayed foliation".	Suggested areas where variety should prove economical.
Methley.....	2nd-4th week December	<i>Dessert</i> . Fruit small, good flavour, poor carrying quality. Good local markets especially in early localities	Highly resistant (very nearly immune)	Paarl, Wellington (early localities).
Santa Rosa...	4th week December-1st week January	<i>Dessert</i> : Very good export and local <i>Jam</i> : Fair	Highly resistant	Stellenbosch, Paarl, Wellington, Groot Drakenstein, Franschhoek, Banhoek, Ceres Warm Bokkeveld, Wolseley.
Gaviota.....	2nd-4th week January	<i>Dessert</i> : Very good export and local	Susceptible.....	Franschhoek, Banhoek, Wolseley, Ceres Warm Bokkeveld.
Kelsey.....	4th week January-late February	<i>Dessert</i> : Export and local very good. Fruit subject to heat injury. Can also be dried as cut fruit	Highly resistant..	Franschhoek, Banhoek, Groot Drakenstein, Paarl, Wolseley, Ceres Warm Bokkeveld.
President.....	Late February-March	European plum. <i>Dessert</i> : Very good, large size. Export and local	Highly resistant.	Franschhoek, Banhoek, Groot Drakenstein, Paarl, Wolseley, Ceres Warm Bokkeveld, Elgin.
Prune d'Agen.	February-March..	European plum. Best variety for prune drying	Very susceptible..	Tulbagh (Winterhoek and Roodesand sections), Cold Bokkeveld, Koo, Ceres Warm Bokkeveld.

* Particulars regarding interplanting of varieties for pollination purposes can be obtained from the Director, Western Province Fruit Research Station, Stellenbosch.

There is only one standard variety, the Royal—the best for factory processing as well as for drying. This variety is unfortunately very prone to excessive shedding of its fruit buds after warm winters and has only a relatively short economic life (20-30 years) due to a physiological gumming disease which progressively depletes the tree.

Bulida, a recent introduction, is less subject to delayed foliation, but does not possess the all-round commercial value of the Royal, being outstanding only in regard to its jam-making qualities. The tree is also brittle and weak at the bud union.

Apples.—The apple requires a long cold winter with a comparatively cool summer; for that reason the main commercial apple plantings in the western Cape Province are to be found at the higher elevations such as Elgin, Ceres, Cold Bokkeveld, Koo (Montagu), and Piquetberg (mountain area).

In the lower-lying and more coastal sections, the tree is subject to "delayed foliation", yields are generally low and irregular, and the quality of the fruit is inferior. A few varieties such as Alma, Winter Banana, Wemmershoek, etc., which are fairly resistant to "delayed foliation", can be grown with a fair amount of success in these parts, but these varieties are in no way comparable in quality with the standard varieties of the recognized apple areas.

During the past 15-20 years the variety position in regard to apples has undergone considerable changes in the western Cape Province.

TABLE III.—*Apple varieties.* *

Variety.	Average season of harvesting.	Commercial value.	General Remarks.
Delicious....	Beginning March—middle March	<i>Dessert</i> : Excellent for local markets and export. Storage properties fair	Starking, a bud sport of Delicious, is generally preferred to-day on account of better colour of fruit. Delicious (Starking) generally less satisfactory than later varieties in Elgin area.
Golden Delicious ...	Early March—late March	<i>Dessert</i> : Very good for local markets and export. Storage properties medium good	Popular all-round dessert variety. Lack of red colour greatest defect.
Ohenimuri.....	Middle March—end March	<i>Dessert and Cooking</i> : Good for local markets and export. Storage properties good	Most widely planted variety to-day. Dependable and heavy bearer. Also called "Dunn's Seedling".
White Winter Pearmain	End March—middle April	<i>Dessert</i> : Good, especially on local markets. Storage properties good	Especially popular in Cold Bokkeveld and Koo areas.
Commerce.....	Beginning April—late April	<i>Dessert</i> : Good, especially local markets. Storage properties very good	Popular in Cold Bokkeveld. Less satisfactory in Elgin. Fruit often inclined to be on small side.
Granny Smith.....	Late April—middle May	<i>Dessert</i> : Very good for local and export markets. Storage properties excellent. Cooking fair	Becoming increasingly popular. Many new orchards planted to this variety. Requires deep fertile soil for good tree growth.
Rokewood.....	Ripening May—late May	<i>Dessert</i> : Good for local markets. Storage excellent	Popular late variety for local storage. Stands up well against wind. Fruit often inclined to be on small side.

* Particulars regarding interplanting of varieties for pollination purposes can be obtained from the Director, Western Province Fruit Research Station, Stellenbosch.

As a result of the decrease in apple acreage in the less favourable areas, many of the varieties such as Wemmershoek that formerly preponderated there, are to-day of minor importance. Even in the colder areas, varieties requiring considerable winter cold (e.g. Rome Beauty) and not well adapted to western Cape Province conditions, are taking a back place to-day. The tendency has also been to plant

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mid-season and late varieties which are better for storage purposes, in preference to earlier-maturing varieties such as Cox's Orange Pippin, Jonathan, etc.

Cooking varieties, e.g. Reinette du Canada, have also given way to dual purpose varieties such as Ohenimuri. Apart from suitable climatic conditions, apples require good well-drained soils with facilities for frequent summer irrigations.

In most apple areas, such conditions are necessarily limited and growers who contemplate expanding their plantings should consider these requirements very carefully.

Some growers frequently make the mistake of overplanting one or two popular varieties in a locality at the expense of other good earlier or later-maturing varieties, thus causing the packing shed to be oversupplied at one stage and undersupplied at another. As a result the grower invariably starts picking the popular variety at too immature a stage.

A selection of 4 or 5 varieties suitable for the area and spread more evenly over the months of March, April and May, is to be preferred.

In Table III a select list is given of the more popular apple varieties which are suitable for planting in the recognized "apple area" mentioned before.

Pears.—The main pear plantings in the western Cape Province occur in the interior valleys of the Ceres Warm Bokkeveld and Groot Drakenstein, although in more recent years substantial acreages have also been planted in the cooler apple regions of Elgin, the Ceres Cold Bokkeveld and the Koo. Other localities of importance are Somerset West (Pearl Valley), Stellenbosch, Banhoek, Franschhoek, and Wolseley.

In regard to "delayed foliation", pear varieties show as much variation in susceptibility as the peach and other fruits. Unfortunately, in the past, all commercial varieties have been planted indiscriminately under all possible climatic conditions. This is undoubtedly one of the main reasons for the low average tree yield in the western Cape Province.

A case in point is the Bon Chretien, the most important commercial variety to-day. Despite its extreme susceptibility to "delayed foliation" it is still grown extensively in all localities ranging from the highlands to the coast. In areas such as Stellenbosch and Groot Drakenstein, where the winters are frequently inclined to be mild, this variety can scarcely be regarded as economical, due to its low and irregular yields. Summer climate again largely determines the quality of Bon Chretien pears. Therefore the Ceres Warm Bokkeveld, which enjoys cold winters and also has a warm dry summer climate, is considered as being best suited to the Bon Chretien both as regards yield and quality of crop. In the cooler apple areas, the Bon Chretien also bears well, due to the absence of "delayed foliation", but the keeping quality and the storage life of the fruit are not as good as under hotter, drier summer conditions. In these areas, however, the fruit could be used for canning or direct marketing (i.e. without preliminary cold storage) on local markets. The Ceres Warm Bokkeveld is the best area for growing Bon Chretiens for export, local storage and local marketing, but the fruit is at the same time also excellent for canning purposes.

Wind is another factor that adversely affects pear growing in the western Cape Province. In many exposed areas south-easterly

storms frequently cause severe losses by blowing off as much as half or more of the crop and seriously blemishing much of the fruit that remains on the tree. Such exposed localities should be avoided at all costs and preference given to naturally sheltered sites. Shelter belts should also be planted, to give added protection.

In Table IV details of the more important pear varieties are given, as well as suggestions regarding areas which are climatically and economically best suited to each. Varieties such as Louise Bonne and Glou Morceau have been left out of the list because they are to-day not favoured in the trade as much as the other standard varieties, and have no other special advantages. Varieties that are inherently poor or irregular croppers such as Doyenne du Comice and Josephine de Malines have also not been considered.

TABLE IV.—*Pear varieties.**

Variety.	Average harvesting season.	Commercial value.	Susceptibility to "delayed foliation".	Suggested areas where variety should prove economical.
Bon Chretien..	Middle January—Middle February	<i>Canning</i> : Excellent. <i>Drying</i> : Excellent. <i>Dessert</i> : Local markets excellent <i>Export</i> : Fair to good	Very susceptible...	Ceres Warm Bokkeveld (export, local and canning) Cold Bokkeveld, Koo, Elgin (canning, local markets).
Beurre Hardy.	Late January—late February	<i>Dessert</i> : Export and local markets very good	Very susceptible..	Ceres (Warm and Cold Bokkeveld) Elgin, Koo.
Beurre Bosc .	Beginning February—end February	<i>Dessert</i> : Export and local markets very good	Moderately susceptible	Ceres (Warm and Cold Bokkeveld), Elgin, Koo, Groot Drakenstein, Wolseley, Banhoek, Franschoek.
Packham's Triumph ...	Middle February—middle March	<i>Dessert</i> : Export and local markets very good	Fairly resistant..	Groot Drakenstein, Stellenbosch, Somerset West, Elgin, Koo, Ceres (Warm and Cold Bokkeveld), Wolseley, Franschoek.
Winter Nells..	Beginning March—end September	<i>Dessert</i> : Export very good, local markets good	Fairly resistant....	Groot Drakenstein, Elgin, Koo, Wolseley, Banhoek, Franschoek, Warm and Cold Bokkeveld
Kieffer.....	Beginning March—end of March	<i>Dessert</i> : Export and local markets fair to poor.	Highly resistant ..	Stellenbosch Somerset West

* Particulars regarding interplanting of varieties for pollination purposes can be obtained from the Director, Western Province Fruit Research Station, Stellenbosch.

New Varieties.

Generally speaking, there is a dearth of suitable deciduous fruit varieties in the western Cape Province to-day, i.e. varieties from which a proper selection can be made by the grower.

To meet this demand the W. P. Fruit Research Station is undertaking large-scale variety trials in which over 300 different varieties of peaches, plums, pears, apricots and apples are being tested. These varieties include promising selections from the U.S.A., South America, Australia and Europe, as well as representative varieties already grown in South Africa. In addition, extensive breeding work is also under way with a view to obtaining better and hardier varieties for the fruit grower.

It is hoped that in the near future a more suitable range of varieties will be available to the industry than is the case at present.

Crop Dusting and Spraying with Light Planes.

Dr. Bernard Smit, Principal Entomologist, Pretoria.

FOR many years the entomologists of the Department of Agriculture have been experimenting with the application of insecticides from aeroplanes, and they may justly claim to be pioneers in this field of investigation in South Africa.



FIG. 1.—Dragon Rapide aircraft used several years ago for dusting wattles from the air for the control of bag worm.

As early as 1926 bluegum plantations on the Rand were dusted with calcium arsenate for the control of the Eucalyptus snout beetle. De Havilland 9 Air Force aircraft were used for this work but in those days the method was very dangerous because it was necessary to fly so close to the trees, and planes were by no means as safe as they are to-day.

Later in 1934 three-engined Hercules troop carriers were used for dusting of locust swarms in Zululand and the poison in this case was sodium arsenate (locust poison). Much experience was obtained but the entomologists had many narrow escapes as the country is rough and mountainous, and the machines, judged by modern standards, were very unmanageable. In 1936 these planes were also used in dusting experiments at Jessievale in the eastern Transvaal for the control of the pine browntail moth in pine plantations*, and the insecticide used in this case was again calcium arsenate.

The results were very satisfactory in so far as killing of the moth caterpillars was concerned, but at the high altitudes at which the pine plantations are situated, the machines were even more difficult to

* Described in Science Bulletin No. 179 of the Department of Agriculture.

control than in Zululand, and it was impossible to make the best use of the poison. Next came the Dragon Rapide aircraft which appeared to be the ideal machine for the dusting of trees and crops from aeroplanes. It is a biplane with two engines and of a much more modern type, so that it is very manoeuvrable and can fly down safely to within thirty feet of the tree-tops. Its speed is reasonable, being about 140 miles per hour, and it can carry a load of about 900 lb. of insecticide. Meanwhile the entomologists in Natal had been working on the control of the wattle bagworm in wattle plantations and had found that natural cryolite dust was an excellent insecticide for this pest. In 1937 an extensive aeroplane dusting experiment was carried out in wattle plantations near Pietermaritzburg, 720 acres of wattles being treated with very good results, so that the method became established as the standard control for wattle bagworm.

During the war years it was not possible to carry on this work, but as soon as aeroplanes and cryolite were again available the work was resumed and last year in October (1946) about 1,800 acres were again dusted. In the intervening years great developments had taken place in the design of planes and the production of new insecticides.

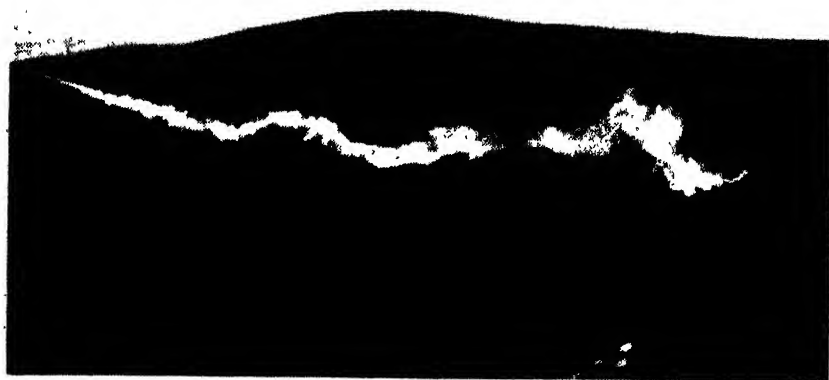


FIG. 2.—Wattle forest being dusted from the air.

Civilian flying is now coming into its own and in all the larger towns of the country we have light plane clubs whose members possess their own aircraft and do a great deal of flying both for business and pleasure. Moreover, many progressive farmers are now buying their own planes of which there are many makes on the market at reasonable prices.

Some of the latest light planes are easy to fly, and can land and take off from an ordinary farm road or level field. They are very manoeuvrable and can be flown to within 20 feet above the ground or tree tops with safety.

The Control of Pre-Harvest Drop of Apples.

Further Results with Hormone Sprays.

Dr. H. L. Pearse, Western Province Fruit Research Station,
Stellenbosch.

THE group of chemical substances now generally known as plant hormones, although there is no positive proof that many of them are ever produced by the plant itself in the natural state, has found many and varied uses in practical horticulture. One of the most important of the practical applications is the use of these substances for preventing the dropping of fruit before it has reached a good size and colour. In fact, the hormone spraying of apples and pears is rapidly becoming a routine orchard practice, and is of considerable economic importance to the grower since by this means he is enabled to pick his fruit at the optimum stage of maturity without incurring losses as windfalls, and furthermore reaps the advantage of larger and better coloured fruit with a long storage life. The achievement of these objects means the saving of many thousands of pounds to the fruit industry.

In a previous article* the author gave an account of experiments carried out at Elgin in the western Cape Province to determine the effectiveness of hormone sprays in controlling pre-harvest drop of apples in that area. Successful results were obtained with the varieties Ohenimuri and Rokewood. During the 1947 season further tests were carried out, using the varieties Ohenimuri, Golden Delicious and Rome Beauty, and an account of the results achieved form the subject of the present article. Numerous queries have been received from farmers as to whether it is possible to add the hormone spray to the last insecticidal spray used for codling moth control. For this reason, experiments were carried out to determine, if, when the hormone spray is added to a nicotine bentonite spray, the action of the hormone is affected. The experiments were carried out as described in the previous report, so that the details need not be repeated here. Ten trees were used in each treatment, and from the time of spraying all dropped fruit was counted at frequent intervals, and at harvest time the number of fruit remaining on the trees was determined, so that the percentage of the total fruit present on the trees at the beginning of the experiment which dropped, could be calculated. As the grower is interested mainly in the number of sound fruit saved, all sound fruits were counted separately and in the results given below only the sound fruit is taken into account.

Results.

(i) *Ohenimuri*.—There were five series in this experiment and the sprays used were as follows:—

(1) Pure alpha naphthalene acetic acid at a concentration of 0.001 per cent.

(2) Alpha naphthalene acetic acid 0.001 per cent. mixed with a nicotine bentonite spray.

(3) Proprietary spray A.

(4) Proprietary spray B.

* Pearse H. L., Hormone Sprays and the Control of Pre-Harvest Drop of Apples, *Farming in S. A.*, August 1946.

In order to obtain the maximum effect, spraying was carried out during warm still weather, and during the warm part of the day. Three applications were made, namely, on 11 February, 27 February and 19 March. For the purpose of the experiment the nicotine bentonite spray was used in spray 2 on all three occasions, although of course it would not normally be so applied. The fruit remaining on the trees was harvested on 31 March. In Table 1 the total percentage drop of sound fruit over the whole period is presented.

TABLE 1.—*Ohenimuri. Percentage drop. 10 Trees in each treatment.*

Series.	Percentage drop.
Unsprayed.....	16.54±1.46
Alpha naphthalene acetic acid 0.001 per cent.....	9.72±1.27
Alpha naphthalene acetic acid and Nicotine bentonite.....	8.89±1.59
Proprietary spray A.....	7.68±1.37
Proprietary spray B.....	7.43±1.00

It is clear that all the hormone sprays were effective in causing a considerable reduction in drop. There was no significant difference in the results with any of various sprays used, and the addition of the nicotine bentonite sprays to the alpha naphthalene acetic acid did not affect the action of the hormone.

In Table 2 the progressive percentage drop throughout the experiment is presented.

TABLE 2.—*Ohenimuri. Progressive percentage drop throughout experiment.*

Date.	Un-sprayed.	Hormone spray. Mean of all Treatments.	Date.	Un-sprayed.	Hormone spray. Mean of all Treatments.
7/2	0.39	0.54	7/3	3.17	3.45
10/2	0.56	0.86	12/3	4.81	4.49
18/2	0.83	1.09	19/3	8.70	6.10
24/2	1.09	1.37	26/3	13.01	7.61
27/2	1.57	2.06	31/3	16.54	8.43
4/3	2.33	2.86			

It is clear from Table 2 that, from the beginning of the experiment up to 12 March, dropping had not been very heavy and furthermore that the hormone sprays had had little or no effect on this slight drop. The trees were originally carrying on the average 680 fruit per tree and thus at this date approximately 30 fruit per tree had dropped. From 12 March to 31 March, however, the unsprayed trees dropped a further 11.73 per cent. of their fruit or approximately 80 fruit per tree, whereas during the same period the sprayed trees dropped only 3.94 per cent. or roughly 27 fruit per tree. During this period, therefore, there was a saving of approximately 53 sound fruit per tree. The first application of sprays in this experiment was timed to be that of the normal last insecticidal spray for codling moth control, but it is clear from the results that the first two applications of the hormone sprays were practically without effect, drop was very slight, and the sprays did not exert any appreciable control. Only the last hormone spray was therefore really necessary and, timed about 12 March, would have resulted in a saving of over 50

CONTROL OF PRE-HARVEST DROP OF APPLES.

fruit per tree. From the point of view of controlling drop effectively, therefore, it is doubtful if there will be many instances when the hormone spray can be added to the insecticidal spray. In most cases a special application of the anti-drop spray, timed as far as possible so that the period of maximum drop coincides with the effective control period of the hormone, will be well worth the extra trouble.

(ii) *Golden Delicious*.—In certain areas, this variety gives a considerable amount of trouble due to dropping, especially if the fruit is picked at the right maturity for cold storage. The fruit is borne on long stalks and it is comparatively easy to cover the fruit well when spraying. Two sprays were applied, the first on 27 February and the second on 19 March. The fruit was picked on 1 April. The only spray used was alpha naphthalene acetic acid 0.001 per cent. The total percentage drop during the experiment is presented in Table 3.

TABLE 3.—*Golden Delicious*. Percentage drop. 10 Trees in each series.

Series.	Percentage drop.
Unsprayed.....	6.68—0.89
Alpha naphthalene acetic acid 0.001 per cent.....	1.67—0.95

The trees were bearing approximately 15,400 fruit per tree at the time of the first application so that spraying in this case saved about 77 sound fruits per tree. It is clear therefore that, although the drop was not very heavy, spraying was well worth-while with trees bearing this amount of fruit.

(iii) *Rome Beauty*.—This variety is very prone to drop its fruits before they are mature and well coloured. The trees were sprayed on 1 March and 19 March, alpha naphthalene acetic acid 0.001 per cent. being used, and the fruit remaining on the trees was harvested on 15 April. The total percentage drop during the experiment is shown in Table 4.

TABLE 4.—*Rome Beauty*. Percentage drop. 10 Trees in each series.

Series.	Percentage drop.
Unsprayed.....	33.64 1.93
Alpha naphthalene acetic acid 0.001 per cent.....	8.86 1.39

The trees were bearing approximately 630 fruits per tree, so that the hormone spray in this instance resulted in approximately 156 more sound fruits remaining on the trees at harvest time—a very considerable gain considering the size of the crop. Furthermore, the fruit was of good size and well-coloured when gathered.

Conclusions.

From the experiments carried out during the 1946 and 1947 seasons, it is reasonably clear that the application of hormone sprays is likely to be of considerable use in the western Cape Province. The practice holds out promise of bringing a threefold benefit to the grower by (a) reducing losses as windfalls to the minimum, (b) enabling him to delay picking until the fruit has reached its maximum size and most attractive appearance, and (c) gaining the maxi-

mum storage life through picking at the correct stage. Good results have so far been obtained with the apple varieties Ohenimuri, Golden Delicious, Rome Beauty and Rokewood. The proprietary anti-drop sprays are now readily obtainable and, indeed, many growers have applied these sprays on a commercial scale during the 1947 season. From the reports received, most growers are highly satisfied with the control of dropping achieved both with apples and pears.

The most difficult point for the grower to decide is when to apply the spray, for if only a single application is to be made and this is put on too early, its effectiveness may wear off some time before the fruit is due to be picked. If, however, the grower first decides the approximate date when each block of trees is to be harvested, the hormone spray can then be applied about three weeks before this date for each particular block. Blocks of a particular variety which are to be picked early for that variety may not require spraying at all. If, however, considerable dropping of sound fruit commences before the date originally fixed for spraying, an application of the hormone spray can be made immediately and then a second spray applied about three weeks later to cover the time until harvesting. Fortunately, as the effect of the spray begins to wear off, dropping increases again gradually, but not as a sudden exceptionally large drop, so that due warning is given that a fresh application is necessary. In exceptional cases three applications may be required. Trees that are bearing a heavy crop are almost invariably well worth spraying because, although the percentage of sound fruit dropping may not be large, the actual saving of fruit is nevertheless very considerable.

Crop Dusting and Spraying with Light Planes:—

[Continued from page 658.]

There is now at least one of these light planes which can at very short notice be fitted with a dusting hopper or otherwise with a liquid spraying apparatus, and which is now being put through its trials in South Africa by the entomologists of the Division of Entomology. In this case the back seat of the plane, which is a two-seater, is removed and the dusting hopper is fixed in its place. In the roof of the cabin a hole is cut in order to fill the apparatus, and an outside lid fits easily over this. The dust falls through two holes cut in the floor and is thrown out into a venturi distributing duct by a light agitator run from an airscrew in the slipstream.

Delivery of the dust, so far in aerodrome trials, has been satisfactory and it is thought that there may be a big future for this method of dusting and spraying crops in South Africa. The machine tested can carry about 300 lb. of dust and flies comfortably at about 65 miles per hour. When letting out about 5 lb. of dust per second over a strip 30 yards wide, it gives a dosage of about 25 lb. per acre, which is effective for most pests that can be controlled by this method. This should be effective for the armyworm, lucerne caterpillar, wattle bagworm, and many other insects.

The great advantage in this case is the low cost of operation and the fact that the machine can be altered for crop dusting or reconverted for passenger work within a few hours. Furthermore, the aircraft can also take off and land on the farm near the crop to be treated.

The Horse on the Farm.

VIII (a).—Breeds of Horses.*

Dr. P. J. v.d. H. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

It is not the intention, nor is it possible, to give a full description of all the breeds of horses of greatest importance to the world to-day. There are numerous text books, publications and articles on all the breeds and all the aspects of horsemanship and horsemastership. One can only browse in this excellent store of literature and write down a few facts and stray thoughts for the breeder who wishes to know more of his particular breed.



FIG. 1.—A famous Thoroughbred. Note the length of leg, powerful gaskin and fore-hand, and general muscular development. (1,200 lb. and 16·1 hands.)

["The Horse"—Nov.-Dec. 1946.]

The horse was probably one of the first animals to be pressed into the service of Man, and in spite of the advancement of mechanized power and more rapid means of transport there is every reason to believe that our ancient friend and ally in all human endeavour and enterprise will remain with us for many years to come.

Mechanized power has admittedly ousted the horse from many of its erstwhile occupations, often very much to the advantage of both horse and man, but this fact has forced horse breeders and users of horses to adjust the horse to altered conditions. The advent of the mechanized age resulted in specialization. So, for example, the war horse disappeared, and cavalry mounts were displaced by various breeds and types of light saddle and harness horses.

There are numerous types and breeds of horses throughout the world. Practically all nations have developed their own particular breeds and types.

The great improver was the Arabian and then the breeds that directly and indirectly are indebted to him for various characteristics

* Part VIII (b) will appear in a following issue and deal with the draught-horse breeds and harness types.

and traits, as for example, the Thoroughbred, Saddle and others which in their time contributed to the numerous light breeds and types such as the Anglo-Arabs, the Orloff of Cossack fame, the Half-Breds of Hungary and Spain, and other European crack cavalry types.

Even so, 90 per cent. or more of the world's horses are grades or common stock. Purebred horses are animals that have certain recognized characteristics and have the hereditary power or prepotency to transmit such distinguishing traits and characteristics with a high degree of certainty to their descendants generation after generation. A purebred animal is the leaven which is used to improve common stock.

Each breed has its own set of characteristics which often differ very widely from those of other breeds. Observe the contrast between a 9-hands Shetland Pony and a giant 18-hands Belgian stallion. Members of the same type often differ only in certain finely defined special breed traits. Compare the Arabian and Thoroughbred or Saddle and Quarter Horse as saddle types or the Hackney and Cleveland Bay as fine or as heavy harness types, and also the Percheron and Clydesdale as draught types.

The differences within the type are most often due to the utility purposes of the breed. So, for example, the sturdy Quarter Horse was bred to be a fast cow catcher, and the Saddle or Palomino as a pleasure riding animal.

This specialization on a utility basis is going on in the leading horse-breeding countries of the world and the blood of the great breeds is freely used according to a strict selective standard in the propagation of useful horses that suit a particular purpose and use.

Indicative of the trend of modern horse breeding in the U.S.A.—a country where mechanized power plays such a prominent rôle—is the following information extracted from an article entitled "New Blood for the Army Remount" ("the Horse", Nov.—Dec. 1946).

The U.S.A Army has imported more than 250 fine stallions and mares from Germany. These horses represent various breeds, but mainly Thoroughbreds, Arabs, Lippizaners, Anglo-Arabs and Half-Breds. The pedigrees of the Thoroughbreds are studded with the names of great sires representing the top bloodlines of the world, namely, Fairway, Phalaris, Blenheim, Son-in-law, etc. Chief among the Thoroughbreds is the great "Nordlicht", winner of the 1944 German Derby. He stands 16.1 hands and weighs 1,200 lb.

Lotnik and Witez II lead the Arab group. Lotnik is a grey, stands 15 hands and weighs 1,000 lb., and is regarded as one of the best Arabian stallions in the world.

Anglo-Arabs and Half-Breds are led by Fenek V (Hungarian). The name Half-Bred is really a misnomer. The Half-Breds are hot-blooded horses of ancient lineage dating back to the time of Tamerlane's conquests. They possess great purity and prepotency, and breed more truly than most other breeds. They are big horses on short legs, deep through the heart, broad of shoulder with great bone and substance, clear legs, short cannon and good feet; they are fine and yet powerful. The Half-Bred is in the opinion of many experts the greatest horse in the world. Here then, indeed, is new blood of the finest for the American army remount.

The Thoroughbred.

The word Thoroughbred is used exclusively for the breed of so-called race horse. There are no thoroughbred pigs or cattle;

registered animals of the different breeds are "purebreds". The General Stud Book of Great Britain is the exclusive stud book of the Thoroughbred.

The Thoroughbred owes its foundation to three oriental sires, Byerley Turk, Darley Arabian and Godolphin Barb, which were imported into England about 1690-1730 and mated to the best light type bred up from Arab and Saracenic blood and favoured by the English aristocracy during the late seventeenth century. The male line descent of every Thoroughbred of note can be traced back direct to one or the other of these three immortal sires. From them spring the famous male lines known respectively as those of Matcham 1748 by Cade—Godolphin; Herod 1758 by Tarter—Byerley Turk, and Eclipse 1764 by Marske by Childers—Darley Arabian.

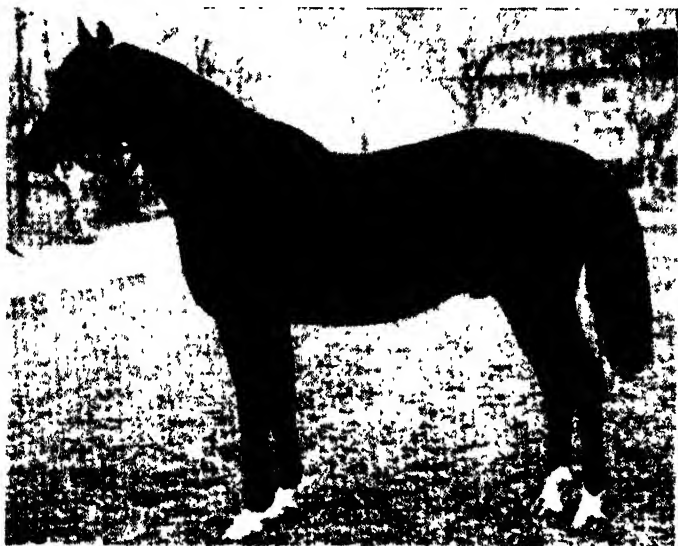


FIG. 2.—A splendid Arab stallion. "A big little horse."

[*"The Horse"*—Nov.-Dec. 1946]

The great indebtedness of the Thoroughbred to the Arab is justly admitted, but it must be clearly recognized by present-day breeders that since those early days the Thoroughbred has been developed mainly from within the breed and that the breed has been religiously guarded against the introduction of foreign blood, even that of the Arab. Having once obtained certain essential characteristics and traits from the Arab, it ultimately developed along lines where the Arab could not improve.

As a result of selective breeding through several centuries for speed on the racecourse, the Thoroughbred is to-day a different animal. Its propagation and establishment as a distinct breed is one of the most outstanding examples of breeding with a definite object in view. Different strains of light blood, especially Arab blood, were used in the formative periods and indiscriminate crossing was avoided and fixation of type and standard stressed.

The Thoroughbred is the great improver of all light-horse stock in all parts of the world; he is thoroughly internationalized. Structurally he has changed in various ways by improving stages, but has retained much of the elegance, high form and aristocratic ensemble of his oriental ancestors while losing nothing of their soundness, tractability and docility. It is for these reasons that

the Arab, which gave such splendid assistance at the birth of the Thoroughbred, is still favoured to-day as an improver of the different light-horse stocks.

In size the Thoroughbred averages about 16 hands, while the mature weight for stallions may vary from 1,000 to 1,400 lb., with 1,000 lb. or a little below as the average when in racing condition.

The general ensemble of the Thoroughbred indicates speed, activity, strength and lively temperament. There is a close correlation of form and function. The legs form more than half the height; they are powerfully muscled in shoulder, forearm, gaskin and buttocks; the joints are broad, clean and dry; the cannons short, smooth and oval and typical of superior quality.

The South African horse stock is derived from Arabian strains imported from 1652 to about 1810 when the first "English blood horses" appeared, and from larger batches of Thoroughbreds imported up to 1870 when, after the loss of our trade in remounts and for other reasons, our horse stock declined to a very low level. The splendid Anglo-Arab type so famed in our remounts and Hantam type was further broken down by indiscriminate crossbreeding with Hackneys, Cleveland Bays, Roadsters and even cart horses.



FIG. 3.—A Hungarian Half-Bred stallion; 1,100 lb. and 15·2 hands.

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In South Africa the Thoroughbred is well established in large studs containing some of the best-bred animals in the world, and has very important influence on present-day trends in horse-breeding enterprises.

The Arab.

The history of the Arab goes back for more than 2,000 years and a great deal has been written about him, much of it in romantic vein. It was the first animal to which civilizing man applied an intelligent breeding programme. In retaining its distinctive characteristics and purity inviolate, it has contributed materially to the improvement of all light-horse breeds of note.

As the result of the purity of its ancient lineage and a strict standard of selective breeding, the Arabian horse of to-day owes its very great value to its ability to transmit its highly desirable characteristics to other breeds and so to improve and add to their attrac-

tiveness and general utility. These characteristics are the result of centuries of intelligent selective breeding which often transcended tradition and became a religion to the faithful owners of the Arab.

This selective breeding ultimately established in the breed, as in no other, the superb qualities of stamina, symmetry, beauty and grace—"the hallmark of authenticity". The beautifully chiselled head (a standard of comparison), the short back, broad loin, muscular quarters, high and gay tail, aristocratic carriage, dense bone, durability, hardiness and tranquil disposition—a trait due to long and close association with Man—all go to make the Arab horse without parallel. Owing to these outstanding and fixed characteristics, the Arabian is in a class by itself in its ability to influence other breeds; he is the "universal leaven" of the horse-breeding world. There is hardly a breed that does not directly or indirectly owe something to this ancient breed.

As has been pointed out, the Thoroughbred, through its foundation sires, springs from the Arabian, and is, in turn, generally accepted as the progenitor or improver of other leading light-horse breeds.



FIG. 4.—A Tennessee Walking Horse.

The Arab always fits into any picture where endurance and stamina in the horse are called for. In eight successive 300-mile endurance trials (1919-26) which were open to, and participated in by, every light-horse breed, Arabians won several of these rides with a higher percentage of places than any other breed.

As recently as last September (1946) the 10-year old Arab mare Moneyna took part in a 156-mile ride—ridden without bridle or bit in the De Anza Ride—and was declared the best all-round horse among 350 that made the ride.

The Arabian is a small horse by general standards—generally 14 to 14.2 hands—a "big little horse" that holds its own against

all-comers where endurance, stamina, grace and gayness are the main features. With selective breeding and superior feed and care a considerable percentage of Arabians reach up to 15.2 hands and weigh round about 1,150 lb. The Arabian, along various lines of oriental strains, is the progenitor of our South African horse stock. Our first remounts exported between 1796 to 1850, and declared the best in the world by British army officers, were mainly of Arabian stock.

The world's best light-horse stock owes its greatest utility characteristics to the Arab and Thoroughbred. The Anglo-Arab, Half-Breds and cavalry mounts of Europe are products of the intelligent mixing of the blood of these wonderful breeds of horses.

There is a deep significance in the fact that Arabian horse husbandry has endured for more than 2,000 years, with a consistent and continuous breeding objective, namely, the propagation of a useful and companionable horse. It is this latter trait, coupled with all the best that horseflesh can give, that has endeared the Arab to discriminating people.

Other breeds may out-run, out-trot and out-jump their parent breed, but none is more prepotent in transmitting equine beauty, intelligence, gameness, tractability and endurance—qualities so highly prized during Man's long history of dependence on the horse.

The Saddler.

There are probably only a dozen or so purebred American Saddlers in South Africa, but they and their crossbred and grade progeny have captured the fancy of horse lovers because of their sporting nature.

The early farmers of the eastern American States in the pre-railway and pre-motor car era required an easy-gaited riding horse with stamina and endurance for long journeys and for checking up on large plantations and ranches.

These demands ultimately established an outstanding saddle-horse breed. The foundation stock possessed much Thoroughbred and Morgan blood until a purebred standard, based on rigid selection and utility features, was reached about a century ago.

The main distinguishing features of this breed are the gaits and the distinct saddle and show traits. In addition to the ordinary gaits—walk, trot, and canter—the cultivated gaits are the rack or single foot (a gait intermediate in movement between the trot and the pace), the fox-trot, the running walk and the slow pace, any one of the lastmentioned three being accepted as the slow gait of a five-gaited saddle horse.

The breed colours are bay, brown and chestnut, and most good Saddlers stand from 15 to 16 hands and weigh from 1,000 to 1,200 lb. There are different types within the breed; some breeders will stress unusual style, fine disposition and even fine harness qualities with extravagant action, but all are agreed on quality, gentle disposition, beautiful conformation and good action.

Other Light Breeds.

Other light breeds that enjoy the attention and promotive interests of large sections in the United States are the Morgans, the Quarter Horse, the Tennessee Walking Horse and the Palomino. The Morgan is one of the older breeds possessing great purity and distinctive characteristics. Outstanding individuals possessing particular traits served as foundation sires for the other breeds.

THE HORSE ON THE FARM.

The Quarter Horse.

The Quarter Horse is a superior, established cow-punching horse possessing great stamina and a burst of speed over short distances, as is required when handling ranch cattle.

The early settlers in Virginia, U.S.A., used a straight track about a quarter-mile in length for racing, and the horses developed from Thoroughbred stallions on native mares, mainly of Spanish descent, became known as "Quarter Horses"—a type that would be called "half-breds" or Anglo-Arabs in other countries where similar strains were blended, our own Hantam horse being such a type. This breed was first developed in the latter part of the 18th century. The prepotent Thoroughbred sire Janus, who was noted for his whirlwind speed over short distances, firmly established the formative type.

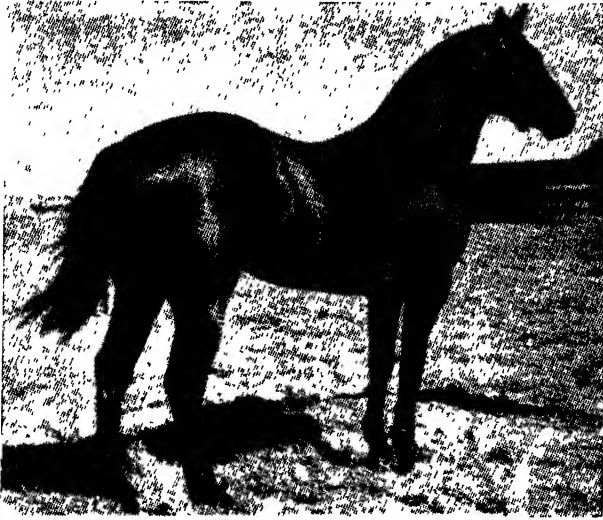


FIG. 5. —Quarter Horse (U.S.A.), Improved cowboy type.

The purity of the breed is so high that its distinctive characteristics continue to be in evidence even after several crosses to Thoroughbreds.

The Quarter Horse is very powerful, with superior muscular development in hindquarters, loin, back, gaskin and forearms. The jaws and cheeks are heavily muscled and the ears smallish. Stallions usually stand 15 hands and weigh 1,200 lb. They are splendid stock horses of quiet disposition and possess great endurance and thriftiness.

Tennessee Walking Horse.

The Tennessee Walking Horse or Plantation Horse possesses a particular, easy all-day walking pace. In its creation, many of the desired traits were derived from other light breeds by careful selection.

Both of these breeds have drawn heavily on the Thoroughbred and Saddler for improving qualities during the formative period of their history, and to-day are distinct breeds of great utility value.

The Palomino.

A most romantic origin is claimed for this "golden" or cream-coloured horse with light mane and tail, its history going back to pre-biblical times and running all through the colourful Arabian

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The Arabian is a small horse by general standards—generally 14 to 14.2 hands—a "big little horse" that holds its own against

and Spanish horse sags. It is a breed still in the making according to definite standards. Various types are recognized, namely:—

(a) *Stock horses*, which are strictly utility horses for all types of ranch work. They are heavily muscled, sound on feet and legs. compact, quiet tempered, fast and handy.

(b) *Bridle-path horses*, with emphasis on easy gaits, quiet temperament, style and beauty.

(c) *Parade horses*.—Here, in addition to all the characteristics of a good horse, the excellence of the animal is based on impressiveness of appearance.

Winter Temperature and Fruit Yield:—

[Continued from page 644.]

Whereas the temperature of Montagu and Banhoek does not appear to be unfavourable, the temperatures of the Hex River Valley, Wolseley-Tulbagh, Franschhoek, Worcester-Robertson and Groot Drakenstein are between 52° F. and 54° F., and delayed foliation must therefore be expected during certain years. In order to ensure a good annual production, only varieties of plums, peaches and other kinds of fruit requiring a light dormant period, must be planted.

The average temperature of Group IV, viz. Somerset West, Stellenbosch, Wellington-Paarl and Groot Constantia is over 54° F. and actually no deciduous fruit trees should be planted here or otherwise only fruit varieties requiring a period of extremely light dormancy. These areas are climatologically more suitable for the grape. In any case, Constantia is essentially a grape area.

It may be assumed that the temperature data furnished here, are a reasonably accurate representation of the macro-climate of the areas mentioned.

It stands to reason that there are small localities in every large area where the climatic conditions, especially the winter temperatures, may be more favourable than in the area as a whole, eg. in portions of Stellenbosch, Franschhoek and Tulbagh. In these localities a larger variety of fruits and varieties may perhaps be cultivated than in the area as a whole. The fruit grower should make full use of these particular localities.

Hence, if the fruit grower in the western Cape Province is faced with the problem of what kinds and varieties of fruit to plant, he should not only note the commercial value of the fruit or variety, but also establish whether it will adapt itself to the particular climatic conditions of his orchard.

Particular attention must be paid to the question of whether the tree will receive sufficient cold during the winter, and the influence of frost and wind must also not be lost sight of. The influence of summer climate on the quality and keeping capacity of the fruit must also be taken into account.

The most suitable kinds and varieties of fruit for the western Cape Province are discussed in an article which is to follow, entitled "Deciduous Fruit Varieties for the Western Cape Province". by Dr. M. W. Black.

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Central Egg-laying Competition at Glen.

Twenty-first Open Competition and Thirteenth Test of the Registered Breeders' Association.

J. A. de Beer, College of Agriculture, Glen, O.F.S.

THE above open competition and the Breeders' Register Test commenced on 2 April 1946 and terminated on 3 March 1947. A total of 510 hens was entered for the former—a decrease of 105 hens as compared with the previous competition; and a total of 360 hens for the Breeder' Register Test—an increase of 91 hens as compared with the previous test.

For the open competition a pen consists of five hens, of which the 4 best hens in each pen are taken into account. For the Registered Breeders' Association Test a pen consists of 10 hens, of which the best 8 birds are taken into account. In this case the hens must be the progeny of registered parents and the owner must be a member of the South African Poultry Breeders' Association.

Although these two contests differ and are consequently given separately, the following are identical: (1) the methods of treatment, feeding and housing; (2) the manner in which the eggs are collected, weighed and recorded, and (3) the date of commencement of the contest which extends over a period of 48 weeks, divided into 12 periods of 28 days each.

At the close of each period the egg-production record, and full details of the positions, moulting, broodiness, sick hens treated, highest producers, and general climatic conditions were sent to each competitor.

Ration.

The ration was the same as in previous years, viz: (a) *Mash*: Yellow mealie meal, 33.5 lb.; lucerne meal, 10 lb.; beanmeal, 2.5 lb.; wheaten bran, 30 lb.; meat meal, 3 lb.; carcass meal, 6 lb.; bonemeal, 2.5 lb.; groundnut oilcake, 5 lb.; white fish meal, 5 lb.; oystershell powder, 3 lb.; and fine salt, 1 lb.

(b) *Cereals*: Crushed yellow mealies.

The egg recording and inspections were carried out in the same way as in the previous years. Only grade "A" eggs were taken into account for positions and certificates.

TABLE 1.—Average Production per Hen.

1 (a) Open Competition.

Breed.	Number of hens.	Production.			Total.
		A.	B.	C.	
White Leghorn.....	190	189.0	14.9	1.5	205.5
Black Australorp.....	119	179.8	16.6	1.3	197.8
Rhode Island Red.....	45	170.7	13.7	1.4	186.0
White Australorp.....	19	156.3	41.5	2.6	200.5
Light Sussex.....	10	156.0	28.3	1.7	186.0
White Wyandotte.....	5	167.6	43.2	1.0	211.8
TOTAL.....	388	181.3	17.3	1.5	200.2

(b) Breeders' Register.

Breed.	Number of hens.	Production.			Total.
		A.	B.	C.	
White Leghorn.....	174	191·7	12·5	1·1	205·4
Black Australorp.....	98	171·8	19·9	1·8	194·6
Rhode Island Red.....	39	183·5	10·1	0·9	194·5
White Australorp.....	8	173·0	30·6	4·2	207·8
Light Sussex.....	10	150·1	29·1	4·5	183·7
TOTAL.....	329	183·4	15·3	1·5	200·3

2. Colleges of Agriculture—Open Competition.

Breed.	Number of hens.	Production.			Total.
		A.	B.	C.	
White Leghorn.....	16	163·5	30·4	5·4	199·3
Black Australorp.....	17	174·9	38·7	3·4	217·0
Rhode Island Red.....	5	173·4	8·2	2·2	183·8
White Australorp.....	4	186·0	25·2	3·2	214·5
Light Sussex.....	5	174·8	14·6	0·2	189·6
TOTAL.....	47	171·8	28·9	3·6	204·3

3. Open Competition, Including Colleges of Agriculture.

Breed.	Number of hens.	Production.			Total.
		A.	B.	C.	
White Leghorn.....	206	187·1	16·1	1·8	205·0
Black Australorp.....	136	179·1	19·3	1·6	200·2
Rhode Island Red.....	50	171·0	13·2	1·5	185·7
White Australorp.....	23	161·5	39·1	2·7	202·9
Light Sussex.....	15	162·2	23·7	1·2	187·2
White Wyandotte.....	5	167·6	43·2	1·0	211·8
TOTAL.....	435	180·3	18·5	1·7	200·6

If the figures for the open competition [see Table 1 (3)] are compared with those of the previous year, it will be seen that the average total production decreased by 2·1 per cent.

The average total production of "A" eggs decreased by 2·2 per cent. in comparison with the previous year, while the average total production of grade "B" eggs remained the same, and that of "C" eggs increased by 0·5 per cent.

If the figures for the Breeders' Register Test [see Table 1 (b)] are compared with those of the previous year, it will be seen that the average total production decreased by 7·2 per cent., whereas the average total production of "B" eggs decreased by 4·7 per cent., and that of "C" eggs increased by 0·7 per cent.

CENTRAL EGG-LAYING COMPETITION.

Winners.

In the *Open Competition* the production figures in respect of the best hens, i.e. those awarded the Blue Ribbon, were as follows:

Best hen in each Division with a minimum of 250 "A" eggs.

Breed.	Hen No.	Pen No.	PRODUCTION.			Total.	Owner.
			A.	B.	C.		
White Leghorn...	333	67	294	0	0	294	Hollandia Poultry Farm
Black Australorp	180	38	301	4	0	305	Sparrenhof Farm.

Breeders' Register.

Breed.	Hen No.	Pen No.	PRODUCTION.			Total.	Owner.
			A.	B.	C.		
White Leghorn...	720	145	274	1	4	279	Dan Jacobs.
Black Australorp	562	113	301	1	0	302	J. J. Nel.

TABLE II.—*Three Best Pens (Special certificate).*

(a) *Open Competition (best 4 hens).*

Position.	Breed.	Pen.	Breed.	PRODUCTION.			Total.	Owner.
				A.	B.	C.		
1st...	Heavy	33	B. Austr.	896	4	1	901	J. J. Nel.
1st...	Light	67	W.L.	1,064	14	3	1,081	Hollandia Poultry Farm
2nd...	Heavy	50	B. Austr.	893	24	8	925	Swartkop Pluimveeplaas
2nd...	Light	64	W.L.	1,008	3	3	1,014	Hasell & Krohn.
3rd...	Heavy	32	B. Austr.	861	8	3	872	Liesbeek.
3rd...	Light	92	W.L.	934	44	6	984	B. H. Wigg.

(b) *Breeders' Register (8 best hens).*

Position.	Breed.	Pen.	Breed.	PRODUCTION.			Total.	Owner.
				A.	B.	C.		
1st...	Heavy	113	B. Austr.	1,776	27	4	1,807	J. J. Nel.
1st...	Light.	147	W.L.	1,927	12	5	1,944	Mrs. W. F. C. Johnson.
2nd...	Heavy	103	R.I.R.	1,674	149	8	1,831	Glen C. A.
2nd...	Light.	139	W.L.	1,895	132	9	2,036	Glenaholm Poultry Farm
3rd...	Heavy	99	R.I.R.	1,668	11	5	1,684	W. F. Brunner.
3rd...	Light.	145	W.L.	1,835	10	16	1,861	Dan Jacobs.

The following Tables show the highest individual production and the highest production per pen of the best 4 hens in 336 days, from the first Central Egg-laying Competition.

TABLE III.
(a) Highest Individual Production.

Year.	OPEN COMPETITION.				BREEDERS' REGISTER.			
	Production.			Breed.	Production.			Breed.
	A.	B.	C.		A.	B.	C.	
1926-27	269	4	0	White Leghorn				
1927-28	284	0	0	White Leghorn				
1928-29	298	1	0	White Leghorn				
1929-30	314	0	0	Black Australorp				
1930-31	258	4	0	Black Australorp				
1931-32	285	1	0	White Leghorn				
1932-33	275	1	0	White Leghorn	The first Breeder's Register Test began in 1934.			
1933-34	280	4	0	White Leghorn	274	4	0	White Leghorn.
1934-35	284	1	0	White Leghorn	267	1	0	Black Australorp.
1935-36	270	9	0	White Leghorn	275	2	0	White Leghorn.
1936-37	270	15	0	White Leghorn	267	0	0	White Leghorn.
1937-38	267	0	0	White Leghorn	267	2	0	Black Australorp.
1938-39	286	16	0	White Leghorn	276	12	0	White Leghorn.
1939-40	302	0	1	White Leghorn	254	13	4	White Leghorn.
1940-41	300	3	0	White Leghorn	285	14	0	White Leghorn.
1941-42	273	12	3	White Leghorn	269	16	1	White Leghorn.
1942-43	283	3	4	White Leghorn	258	0	4	White Leghorn.
1943-44	273	0	1	Black Australorp	302	1	0	Black Australorp.
1944-45	327	0	1	Black Australorp	304	0	1	Black Australorp.
1945-46	292	3	1	White Leghorn	301	1	0	Black Australorp.
1946-47	301	4	0	Black Australorp				

(b) Pen with highest production (best 4 hens).

(i) Open Competition.

From the first Central Egg-laying Competition (1926) until 1932, the production of the whole pen of 5 hens is given. From the 1932/33 competition the production of only the best 4 hens in the pen is given and the pens with the highest production were as follows:—

Year.	LIGHT BREEDS.				HEAVY BREEDS.			
	Production.			Breed.	Production.			Breed.
	A.	B.	C.		A.	B.	C.	
1932-33	974	34	0	White Leghorn	950	5	1	Black Australorp.
1933-34	1,012	6	0	White Leghorn	931	31	0	Black Australorp.
1934-35	1,019	6	0	White Leghorn	982	50	0	Black Australorp.
1935-36	971	24	3	White Leghorn	855	65	5	Black Australorp.
1936-37	993	49	2	White Leghorn	997	65	2	Black Australorp.
1937-38	921	27	1	White Leghorn	905	14	0	Light Sussex.
1938-39	992	66	22	White Leghorn	928	9	1	Rhode Island Red.
1939-40	1,063	3	3	White Leghorn	1,025	2	2	Rhode Island Red.
1940-41	988	68	1	White Leghorn	943	21	1	Black Australorp.
1941-42	970	63	4	White Leghorn	945	58	1	Black Australorp.
1942-43	964	7	1	White Leghorn	989	20	4	Black Australorp.
1943-44	909	43	1	White Leghorn	970	47	5	Black Australorp.
1944-45	1,011	7	1	White Leghorn	1,110	33	2	Black Australorp.
1945-46	1,027	15	4	White Leghorn	1,046	15	1	Rhode Island Red.
1946-47	1,064	14	3	White Leghorn	896	4	1	Black Australorp.

CENTRAL EGG-LAYING COMPETITION.

(ii) *Breeders' Register (best 8 hens).*

Year.	PRODUCTION.			Breed.
	A.	B.	C.	
1934-35.....	1,860	15	0	White Leghorn.
1935-36.....	1,820	138	2	White Leghorn.
1936-37.....	1,993	75	0	White Leghorn.
1937-38.....	1,850	183	4	White Leghorn.
1938-39.....	1,948	40	5	White Leghorn.
1939-40.....	1,912	105	12	White Leghorn.
1940-41.....	1,783	126	6	White Leghorn.
1941-42.....	1,750	90	9	White Leghorn.
1942-43.....	1,750	119	1	White Leghorn.
1943-44.....	1,838	32	6	White Leghorn.
1944-45.....	1,932	10	7	White Leghorn.
1945-46.....	1,954	13	5	Black Australorp.
1946-47.....	1,927	12	5	White Leghorn.

TABLE IV.

The following hens laid more than 275 "A" eggs in 336 days and were consequently tested for 365 days. Their production during the 365 days was as follows:—

Hen No.	Pen No.	Breed.	PRODUCTION.			Owner.
			A.	B.	C.	
162.....	33	Black Australorp	300	0	0	J. J. Nel.
186.....	38	Black Australorp	317	4	0	Sparrenhof Farm.
304.....	61	White Leghorn...	299	2	0	Glenaholm Poultry Farm.
314.....	63	White Leghorn...	299	0	0	H. E. Green.
333.....	67	White Leghorn...	316	0	0	Hollandia Poultry Farm.
531.....	107	Black Australorp	300	4	0	V. T. Crankshaw.
562.....	113	Black Australorp	314	1	0	J. J. Nel.
871.....	175	Black Australorp	310	2	1	Stellenbosch - Elsenburg College of Agriculture

TABLE V.—*Hens with the Highest Production.*

(a) *Open Competition.*

Breed.	Number in competition.	From 240 "A" eggs.		From 220 "A" eggs.		From 200 "A" eggs.	
		Number of breed.	Percent-age of breed.	Number of breed.	Percent-age of breed.	Number of breed.	Percent-age of breed.
White Wyandotte....	5	—	—	1	20.0	1	20.0
Light Sussex.....	10	1	10.0	—	—	2	20.0
White Australorp....	19	1	5.2	4	21.0	2	10.5
Rhode Island Red....	45	2	4.4	4	8.9	12	26.6
Black Australorp.....	119	14	11.7	14	11.7	25	21.0
White Leghorn.....	190	30	15.8	38	20.0	31	16.3
TOTAL.....	388	48	12.3	61	15.7	73	18.8

(b) Breeders' Register.

Breed.	Number in competition.	From 240 "A" eggs.		From 220 "A" eggs.		From 200 "A" eggs.	
		Number of breed.	Percentage of breed.	Number of breed.	Percentage of breed.	Number of breed.	Percentage of breed.
Light Sussex.....	10	—	—	2	20.0	—	—
White Australorp.....	8	—	—	2	25.0	2	25.0
Rhode Island Red....	39	5	12.8	4	10.2	6	15.3
Black Australorp.....	98	11	11.2	10	10.2	17	17.3
White Leghorn.....	174	24	13.8	32	18.3	35	20.1
TOTAL.....	329	40	12.1	50	15.2	60	18.2

(c) Colleges of Agriculture—Open Competition.

Light Sussex.....	5	—	—	—	—	2	40.0
White Australorp.....	4	—	—	—	—	—	—
Rhode Island Red....	5	—	—	1	20.0	1	20.0
Black Australorp.....	17	4	23.5	1	5.9	2	11.7
White Leghorn.....	16	—	—	1	6.2	2	12.5
TOTAL.....	47	4	8.5	3	6.4	7	15.1

Table VI permits of a comparison between the average production per hen of the four main breeds entered for previous competitions. (See page 677).

Post-mortem Examination.

All hens which died in the course of the contest, were sent to Onderstepoort for examination. According to post-mortem reports received, the deaths were caused by lymphoid leucosis, internal haemorrhage due to fatty degeneration and rupture of the liver, inflammation, cancer, fowl paralysis and nephritis. Copies of these reports were sent to the owners concerned.

TABLE VII.—*Mortality during latest Competition.*1. (a) *Open Competition.*

Breed.	Number of Hens.	Number of Deaths.	Percentage Deaths.
White Leghorn.....	215	25	11.6
Black Australorp.....	145	26	17.9
Rhode Island Red.....	55	10	18.1
White Australorp.....	25	6	24.0
Light Sussex.....	10	—	0.0
White Wyandotte.....	5	—	0.0
TOTAL.....	455	67	14.7

(b) Breeders' Register.

Breed.	Number of Hens.	Number of Deaths.	Percentage Deaths.
White Leghorn.....	190	16	8.4
Black Australorp.....	110	12	10.9
Rhode Island Red.....	40	1	2.5
White Australorp.....	10	2	20.0
Light Sussex.....	10	—	0.0
TOTAL.....	360	31	8.6

CENTRAL EGG-LAYING COMPETITION.

TABLE VI.—Average Production Per Hen.

Year.	WHITE LEGHORNS.				BLACK AUSTRALORNS.				RHODE ISLAND REDS.				LIGHT SUSSEX.							
	Num-ber of hens.	Average per hen.			Num-ber of hens.	Average per hen.			Num-ber of hens.	Average per hen.			Num-ber of hens.	Average per hen.						
		A.	B.	C.		Total.	A.	B.		C.	Total.	A.		B.	C.	Total.				
Open Competition. 1929-30.....	535	204.6	7.5	0.3	212.5	125	195.4	9.7	0.3	205.5	45	177.9	4.3	0.1	182.4	10	148.2	8.2	0.5	156.0
1930-31.....	690	195.9	8.9	0.3	205.2	155	187.0	9.0	0.2	194.2	70	171.4	4.5	0.1	176.9	12	116.1	54.3	10.5	181.0
1931-32.....	572	179.6	15.8	0.7	196.2	156	174.0	12.9	0.6	190.9	16	149.4	4.3	0.1	157.1	—	—	—	—	—
1932-33.....	592	168.7	22.9	1.0	192.7	152	150.7	39.2	2.8	192.7	28	91.5	23.6	0.8	115.6	—	—	—	—	—
1933-34.....	292	181.0	24.6	1.4	217.0	96	164.1	27.3	2.8	193.9	12	136.1	5.9	6.5	201.5	—	—	—	—	—
1934-35.....	244	185.5	22.5	1.2	209.2	96	170.3	30.4	2.0	202.6	8	220.5	7.4	0.4	228.3	—	—	—	—	—
Open Competition. Breeders' Register 1935-36.....	252	190.0	29.6	1.5	222.1	128	185.2	37.2	16.3	224.0	16	195.1	15.5	0.3	211.0	—	—	—	—	—
1936-37.....	308	175.7	36.3	2.3	214.4	128	151.4	48.2	1.8	201.5	24	157.9	23.2	0.3	181.5	16	132.0	35.8	1.9	169.7
Open Competition. Breeders' Register 1937-38.....	96	165.2	38.4	2.1	205.8	56	140.1	53.3	2.6	205.0	8	128.2	50.7	1.0	189.0	—	—	—	—	—
1938-39.....	292	191.5	23.3	0.8	215.7	92	191.4	17.5	0.3	209.3	40	161.7	25.1	2.2	207.4	12	148.7	33.4	1.7	183.9
Open Competition. Breeders' Register 1939-40.....	48	202.2	14.5	0.6	217.3	40	191.0	19.5	0.9	211.6	16	161.7	23.06	0.2	185.06	—	—	—	—	—
1940-41.....	232	177.0	29.2	2.0	208.2	100	136.9	39.3	1.6	177.7	32	139.1	44.8	1.6	185.5	24	99.7	6.8	6.1	168.5
Open Competition. Breeders' Register 1941-42.....	48	188.8	20.9	0.6	210.4	24	190.16	32.2	0.45	222.0	8	160.5	50.7	0.62	212.0	—	—	—	—	—
1942-43.....	280	193.0	22.0	2.0	217.0	112	181.4	21.7	2.3	205.4	24	196.3	17.5	0.8	214.6	16	114.3	43.7	7.9	165.9
Open Competition. Breeders' Register 1943-44.....	80	191.8	20.6	2.5	214.9	32	162.0	12.4	0.6	175.0	—	—	—	—	—	—	—	—	—	—
1944-45.....	274	183.6	24.9	1.3	209.8	133	180.6	23.9	1.8	206.3	52	182.7	27.7	0.8	211.2	29	137.6	51.8	4.8	194.2
Open Competition. Breeders' Register 1945-46.....	170	199.5	25.6	2.9	223.0	126	196.8	18.2	1.1	216.1	—	—	—	—	—	—	—	—	—	—
1946-47.....	309	175.5	36.9	2.7	215.1	112	171.5	30.7	1.0	203.2	48	163.3	34.5	1.8	199.6	42	113.9	42.5	2.2	158.6
Open Competition. Breeders' Register 1947-48.....	62	186.7	37.1	2.1	225.8	46	186.7	23.2	0.7	210.6	—	—	—	—	—	—	—	—	—	—
1948-49.....	343	181.8	30.3	2.5	214.7	165	165.7	28.2	2.2	196.1	77	176.0	31.0	1.1	208.1	27	111.7	70.5	6.3	188.6
Open Competition. Breeders' Register 1949-50.....	77	199.8	20.2	2.3	222.2	23	143.2	8.1	2.1	153.4	—	—	—	—	—	7	137.2	69.7	3.0	200.0
1950-51.....	277	180.5	25.1	1.9	207.6	165	173.4	24.0	1.6	199.1	70	171.3	17.9	1.0	190.0	27	135.0	39.6	9.2	183.9
Open Competition. Breeders' Register 1951-52.....	55	183.5	17.0	3.2	203.7	17	187.4	29.4	1.1	218.0	—	—	—	—	—	—	—	—	—	—
1952-53.....	304	175.6	18.1	1.8	195.5	131	182.0	14.4	1.7	198.1	71	187.6	8.8	1.1	197.5	14	141.6	24.5	3.5	169.7
Open Competition. Breeders' Register 1953-54.....	122	185.5	13.6	2.0	201.2	39	156.6	8.4	1.0	166.1	—	—	—	—	—	16	103.6	7.2	2.1	112.9
1954-55.....	282	185.1	21.2	1.2	207.6	133	188.0	11.2	0.8	200.1	85	167.1	21.6	0.7	189.5	15	187.0	8.0	2.0	197.1
Open Competition. Breeders' Register 1955-56.....	156	195.5	21.1	1.3	218.1	29	203.0	22.4	1.4	227.7	9	136.0	68.1	2.0	206.1	8	148.3	42.1	1.2	191.7
1956-57.....	273	180.7	17.0	0.8	209.5	134	188.4	13.0	0.2	202.7	87	172.4	25.6	0.4	198.4	18	143.0	10.9	0.6	154.6
Open Competition. Breeders' Register 1957-58.....	147	193.0	19.4	1.0	212.5	64	138.1	17.8	0.6	206.6	9	153.3	19.6	0.2	175.2	10	112.6	36.3	0.5	149.4
1958-59.....	206	187.1	16.1	1.8	205.0	136	179.3	19.3	1.6	200.2	50	171.0	13.2	1.5	185.7	15	162.2	28.7	1.2	187.2
Open Competition. Breeders' Register 1959-60.....	174	191.7	12.5	1.1	208.4	98	171.8	19.9	1.8	194.6	39	183.5	10.1	0.9	194.5	10	150.1	29.1	4.5	183.7

2. Colleges of Agriculture—Open Competition.

Breed.	Number of Hens.	Number of Deaths.	Percentage Deaths.
White Leghorn.....	20	4	20.0
Black Australorp.....	20	3	15.0
Rhode Island Red.....	5	—	0.0
White Australorp.....	5	1	20.0
Light Sussex.....	5	—	0.0
TOTAL.....	55	8	14.5

3. Open Competition including Colleges of Agriculture.

Breed.	Number of Hens.	Number of Deaths.	Percentage Deaths.
White Leghorn.....	235	29	12.3
Black Australorp.....	165	29	17.5
Rhode Island Red.....	60	10	16.6
White Australorp.....	30	7	23.3
Light Sussex.....	15	—	0.0
White Wyandotte.....	5	—	0.0
TOTAL.....	510	75	14.7

4. Whole Test.

Number of
Hens.
870

Number of
Deaths.
106

Percentage
Deaths.
12.1

The mortality given in Table VII (3), viz. 14.7 per cent., constitutes an increase of 3.8 per cent. on that of the previous year. For the Breeders' Register [Table VI 1 (b)] the mortality was 8.6 per cent., a decrease of 2.1 per cent. as compared with that of the previous year.

Mortality during latest and previous competitions.

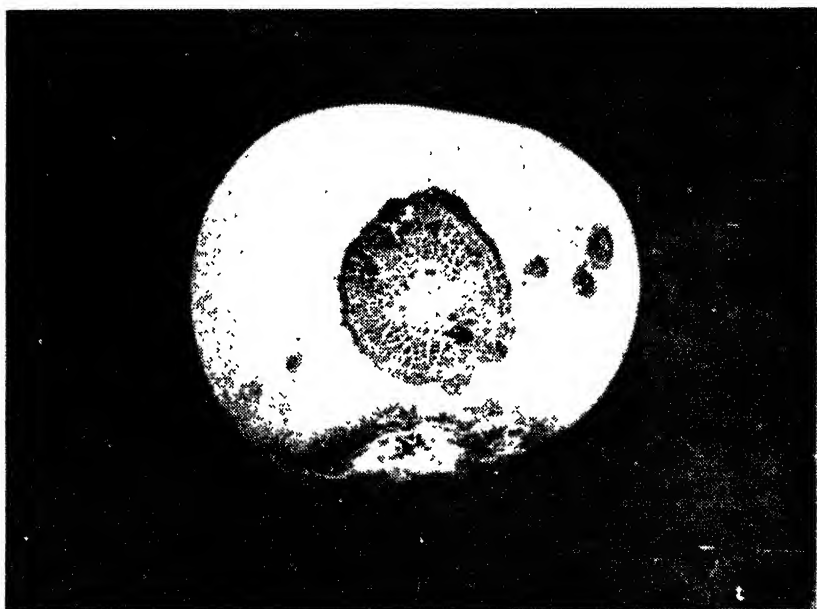
(a) Open Competition.

Competition.	Year.	Number of Hens.	Number of Deaths.	Percentage Deaths.
First.....	1926-27	635	28	4.4
Second.....	1927-28	980	46	4.7
Third.....	1928-29	875	46	5.9
Fourth.....	1929-30	1,000	60	6.0
Fifth.....	1930-31	1,000	42	4.2
Sixth.....	1931-32	990	61	6.2
Seventh.....	1932-33	520	46	8.8
Eighth.....	1933-34	450	44	9.8
Ninth.....	1934-35	700	39	5.6
Tenth.....	1935-36	843	74	8.8
Eleventh.....	1936-37	685	48	7.0
Twelfth.....	1937-38	595	58	9.7
Thirteenth.....	1938-39	715	69	9.6
Fourteenth.....	1939-40	705	79	11.2
Fifteenth.....	1940-41	735	109	14.8
Sixteenth.....	1941-42	740	89	12.1
Seventeenth.....	1942-43	765	98	14.7
Eighteenth.....	1943-44	870	94	11.9
Nineteenth.....	1944-45	865	89	11.0
Twentieth.....	1945-46	884	96	10.8
Twenty-first.....	1946-47	870	106	12.1

Fusicladium of Apples.

A. J. Louw, Western Province Fruit Research Station.

WITH the increased planting of apple trees in the winter rainfall area, outbreaks of *Fusicladium* now occur annually in localities where previously the disease had not been known. As usual, farmers to whom the disease is unfamiliar, refer to it as "yet another new disease!" Those farmers will be interested to learn that already on the occasion of a Cape Fruit Farmers' Congress held at Oudtshoorn in 1905, a heated discussion took place on this new disease which threatened the Cape orchards. The government was earnestly requested to introduce legislation which would make the further importation of this disease impossible. Australia, where *Fusicladium* (or "black spot" as the disease is called in that country) was already known, was pointed out as the culprit, and the prohibition of all apple imports from that country was mooted.



Apple infected with *Fusicladium*.

Today we know that it is very unlikely that this disease could have been introduced into the country through the medium of fruit. Admittedly, apples had been imported on a large scale from Australia at that time. This fruit, however, landed in South Africa during the winter months and investigation has since proved that the causal fungus cannot survive the winter on the fruit and cause infection the following season. It is much more probable that the disease was introduced into the country with nursery trees. The natural place of hibernation for the *Fusicladium* fungus is the leaves, and such old leaves may well be present on the nursery trees and in packing material. In this way then, the infected leaves find their way to fruit farms from which the disease rapidly spreads to apple orchards in the vicinity. In fact, this is the most likely way in which the disease today still spreads from farm to farm. Therefore the farmers acquiring young trees for planting on farms, hitherto uninfected

with *Fusicladium*, should take care not to introduce infected leaves into their orchards. It is advisable that all leaves and packing material should be destroyed beforehand. Mere spraying of the trees is not sufficient since the fungus, at this stage, is protected in the leaf tissue and cannot be killed by the spray mixture.

For those farmers who already have the disease in their orchards, such a precautionary measure would not serve any purpose. They should, however, spray all apple trees to prevent infection during the growing season. A great problem for these farmers has always been the variable intensity of the disease from one year to another. They have found that the slight degree in which *Fusicladium* occurs in some years, does not justify the costs of spraying. The result is that many growers wait until the disease has made an appearance before they start spraying. This procedure has invariably proved disastrous to the crop in years of severe *Fusicladium* epidemics. Apart from the direct loss resulting from the infection of the fruit, the heavy spraying that has to be applied in such circumstances also has a very harmful effect on the fruit and the trees. Observations and controlled field experiments have repeatedly shown that once *Fusicladium* has been given an opportunity to establish itself on the trees at the beginning of the season, it is not possible to control the disease satisfactorily during that particular season.

The question has often been asked whether it is not possible to determine beforehand when and where outbreaks of the disease may be expected. Such determinations would certainly be of value and save apple growers thousands of pounds. An analysis of factors affecting the disease will, however, show how difficult it is to determine the likelihood of such epidemics beforehand.

The Influence of Temperature and Moisture Conditions.

Farmers have learnt from experience to associate the *Fusicladium* menace with rain and foggy weather, to such an extent that some growers erroneously regard foggy weather as the real cause. Rainy weather is, however, a predisposing cause of the disease in that the spores or "seeds" of the casual fungus require moisture for germination, just like the seeds of the more highly specialized plants. In contrast with the powdery-mildew fungi for instance, the fungus responsible for peach mildew, which requires only a high atmospheric humidity for the germination of their spores, the *Fusicladium* fungus actually requires free water for germination; in other words, the leaves and fruit on the tree must be wet before *Fusicladium* infection can take place. The tree must also remain wet for a definite period, depending on the prevailing temperature, before the fungus can penetrate the leaf or fruit and bring about infection. So, for instance it has been established that the minimum period for which the surface must remain wet, is 9 hours at 15°C, while infection can take place within 6 hours at 19°C. Thus, after rains of short duration followed by conditions which allow the trees to dry within shorter periods than these, at the respective temperatures, no infection will take place. Sometimes, especially in late summer, it may also happen that, owing to too high temperatures, no infection will take place even if the trees remain wet for long periods on end and *Fusicladium* spores are present in abundance. It has, for instance, been found in controlled experiments, that, at a temperature of 25°C no infection took place, even after the trees had been kept wet for 19 days on end. The supposition that rain and foggy weather bring on *Fusicladium* can, therefore, not be accepted without qualification. This is also evident from a comparison between the incidence of the disease in various regions and seasons.

FUSICLADIUM OF APPLES.

Geographical and Seasonal Influences.

There is a close correlation between the geographical incidence of *Fusicladium* and the intensity of commercial apple growing. It so happens that in those regions where apples are relatively free from the disease, the climate is also more or less unfavourable for the production of regular crops and fruit of good quality. The disease is especially harassing in regions with a wet and cool spring and a cool summer.

A survey of the incidence of *Fusicladium* in various parts of the Western Cape Province over the period 1941 to 1944 has indicated that the disease is especially rife in Elgin and the Koue Bokkeveld in the district of Ceres—the two principal apple producing districts of the winter-rainfall area. During the period concerned the disease was more severe in the Koue Bokkeveld than in Elgin. Only during the 1943/44 season did the disease cause more damage in Elgin than in the Koue Bokkeveld. During these four years *Fusicladium* occurred only slightly in the Koo in the Montague district. At Villiersdorp the disease was observed during one year only.

The Koo, Koue Bokkeveld and Elgin have relatively cool summers, owing to their altitude and in the case of Elgin, also because of its proximity to the sea. The summer climates of these districts are further also influenced by the relative absence of the parching south-east winds, which are so common over a large part of the winter-rainfall area and which are usually followed by severe heat waves. While the Western Cape Province experiences its tempestuous south-easters, the sky is usually overcast at Elgin and very often light showers occur which further temper the climate.

During the nights and mornings in spring and summer the Elgin and Bokkeveld districts are also frequently wrapped in fog carried to those heights by sea-winds and this provides favourable conditions for the development of the disease. At Villiersdorp the influence of the sea on the climate is to a great extent cut off by surrounding mountains and the summer is, therefore, hot, with a low atmospheric humidity. In spite of the fact, therefore, that the air is relatively humid during spring, *Fusicladium* is seldom severe enough in this district to justify spraying.

It would appear that the average temperature of a particular area has an important influence on the disease. In the Koue Bokkeveld both the winter and summer temperatures are generally lower than at Elgin, and the more severe incidence of the disease in the first mentioned area may be attributable to this fact.

The available data show no direct relation between the rainfall of the respective areas and the incidence of the disease. In Elgin and the Koue Bokkeveld the total rainfall during the spring months (September—November) of the period of four years (1941—1944) was as follows: Elgin: 15.14", 3.22", 5.87" and 12.16"; Koue Bokkeveld: 6.82", 2.12", 5.67" and 3.77". The rainfall during this critical period in the development of the disease, has, therefore, been generally higher in Elgin than in the Koue Bokkeveld, and yet the disease was more severe in the latter district during three out of the four years. In 1941 the disease occurred only slightly in Elgin in spite of heavy rains during spring, while in the same season the disease was pretty rife in the Koue Bokkeveld in spite of the low rainfall.

The relative absence of *Fusicladium* in Villiersdorp must be attributed to other causes than inadequate moisture during spring. For the season 1941/42 the total precipitation in Villiersdorp during

the four months September—December, was 5·86 inches spread over 17 days. In that season hardly any trace of *Fusicladium* could be found there.

During the 1944/45 season, when an unparalleled *Fusicladium* epidemic occurred in the Koue Bokkeveld and no sign of the disease was noticed in Villiersdorp, the first mentioned place had only 4·3" of rain over the same period which fell on seven different days. The averages of temperature and relative humidity for the Koue Bokkeveld during this period were 57·8° F. and 71·0 per cent. respectively, as against 72·7° F. and 75·0 per cent. for Villiersdorp. It would therefore appear that the high temperatures restrict the development of *Fusicladium* at Villiersdorp.

During the past few years *Fusicladium* undoubtedly tended to be more severe. Meteorological data prior to 1941 for the areas under review are incomplete and information on the incidence of the disease very limited. Between 1938 and 1941, however, only two individual cases of serious losses as a result of *Fusicladium* were recorded, and that in spite of the fact that most growers were rather lax in applying control measures. In two of these years the rainfall at Elgin during the critical spring months exceeded 10", while in 1943—a record *Fusicladium* year for Elgin—the spring rainfall amounted to only 5·87 inches. These limited data indicate that the increased incidence of *Fusicladium* during the past few years is not related to the corresponding higher rainfall. Although the favourable effect of moisture conditions on the development of the disease may not be disregarded, it would, therefore, appear that there are also other factors which may predominate over the effect of wet conditions.

Varietal Differences.

Apple growers have learnt from experience that all apple varieties are not susceptible to *Fusicladium* in the same degree. It sometimes happens, however, that varieties which are regarded as resistant to *Fusicladium* in one area, may be highly susceptible to the disease in another environment. In order to obtain a reliable picture of the relative susceptibility of various varieties, observations were made over a period of five years in various parts of the winter-rainfall area, and the varieties which are commercially grown in the Western Cape Province were classified according to susceptibility to *Fusicladium*, as follows:—

<i>Extremely Susceptible.</i>	<i>Highly Susceptible.</i>	<i>Moderately Susceptible.</i>	<i>Slightly Susceptible.</i>
White Winter	Ohenimuri.	Golden Delicious.	Winesap.
Pearmain.	Rome Beauty.	Granny Smith.	Rokewood.
Red Delicious.	Wemmershoek.	Laxton's Superb.	
Red New Year.	Jonathan.	Black Ben Davis.	
Senator.	Commerce.	Cox's Orange Pippin.	
Cleopatra.			

There is no doubt that White Winter Pearmain and Red Delicious are the two varieties that are the most seriously affected by the disease. The apparent ability of some varieties to resist the disease, must be attributed to the fact that they foliate later when the moisture and temperature conditions are less favourable for the disease. This view is borne out by the already mentioned fact that the same variety shows variations as regards susceptibility in different areas. In the Koue Bokkeveld where the Commerce variety is principally grown, and where trees foliate approximately two weeks earlier than in Elgin, this variety is highly susceptible to *Fusicladium*, whereas in the last mentioned district the disease is seldom seen on the few trees of this variety that are found there. The Wemmershoek variety

again, is grown principally in the vicinity of Villiersdorp, where, as has been indicated, the climatic conditions are not favourable for Fusicladium. The fact, therefore, that this variety is free from the disease in that district does not mean that it is resistant to the disease. On the contrary, the disease has more than once been found on Wemmershoek trees in other areas.

Conclusion.

In the light of all these factors affecting the incidence of Fusicladium, it is clear that no uniform policy for its control can be laid down for all circumstances. It is, therefore, necessary for the grower to get to know his own environment, and even more so, his different orchards through observations over a number of years, and then to put into practice the prescribed spraying programme as circumstances may require. In orchards that are sporadically subject to the disease, it is unwise to delay spraying operations pending the appearance of the disease. In such cases the application of control measures must be regarded as an insurance policy. The cost of spraying in Fusicladium-free years is not a waste, but the premium due on the insurance policy. Nevertheless, there are specific environments and varieties that are never subject to Fusicladium. In this case the grower who knows his farm and environment, will be able to decide for himself as to the advisability of cutting out spraying operations altogether.

Central Egg-laying Competition at Glen:—

[Continued from page 678.]

(b) Breeders' Register.

Competition.	Year.	Number of Hens.	Number of Deaths.	Percentage Deaths.
First.....	1934-35	200	11	5.5
Second.....	1935-36	208	14	6.73
Third.....	1936-37	130	11	8.4
Fourth.....	1937-38	100	10	10.0
Fifth.....	1938-39	150	21	14.0
Sixth.....	1939-40	150	17	11.3
Seventh.....	1940-41	200	12	10.0
Eighth.....	1941-42	130	20	15.6
Ninth.....	1942-43	80	8	10.0
Tenth.....	1943-44	190	13	6.8
Eleventh.....	1944-45	220	18	8.1
Twelfth.....	1945-46	269	29	10.7
Thirteenth.....	1946-47	360	31	8.6

Conclusions.

From the results of the past competition, it is evident that in future breeders will have to pay more attention to:—

- (1) Strong constitution;
- (2) the breeding of hens from parents with high egg production as well as stamina;
- (3) the elimination of families in which cancer occurs;
- (4) egg size as well as strength of shell, and
- (5) hens which are free from B.W.D.

Ground Tunnels in the Vlekpoort Valley.

Roscar du Toit, Officer-in-Charge, Tarka Conservation Area.

AN elderly farmer who grew up in the Vlekpoort valley in the Maraisburg district tells how his late father could not ride through the valley on horseback because all the vleis were overgrown with common reed and other dense vegetation and how to-day he himself cannot ride through it because of all the deep gullies.

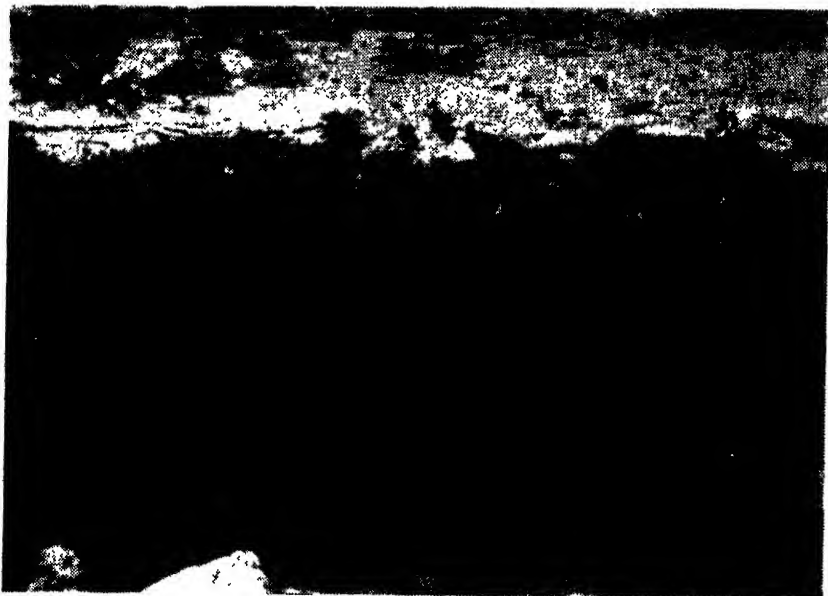


FIG. 1.—Beginning of a tunnel between two parallel gullies. The tunnel is 30ft. long and 8 ft. high.

A phenomenon in connection with these gullies which has received little attention up to the present, is the insidious formation of tunnels or underground passages between parallel gullies, which promote the continuous expansion of the gullies and the general destruction.

It is not easy to explain the origin of the underground passages or tunnels and the causes are not necessarily the same in all cases. It is quite clear, however, that these conditions can only arise in deep, highly erodible soils which go into suspension easily when damp and contain sedimentary layers of fine gravel or sand. Where two gullies are joined by gravel or sand layers, it may be assumed that the water has filtered through and in this way caused the tunnel. In some cases the rotting of plant roots may also cause passages through which the water can flow. Tunnels made by springhares, meercats, antbears, ants, etc., may also be the cause of this evil. Rock rabbits (dassies) are usually found in this undermined ground and for this reason the "caves" in which they live are known as "dassie nests", but it is doubtful whether these animals which do not really dig holes, contribute much towards the tunneling process.

GROUND TUNNELS IN THE VLEKPOORT VALLEY.

Apart from the ordinary tunnel between two gullies, there is another peculiar phenomenon, viz., a deep hole unexpectedly formed straight down in an undamaged piece of ground and connected with a nearby gully by a tunnel. It remains for the observer to determine whether such a deep hole was caused by a rotted plant root, an animal or ants. There is, however, every reason to believe that this type of hole, sometimes 15 ft. or deeper, may be caused by a very high percentage of air space in the ground at the place in question, especially if the texture and structure of the soil are of the type which facilitates this.



FIG. 2.—The same as fig. 1 seen from the normal surface of the existing ground.

In the case of ordinary ground dam walls and other soil embankments constructed for purposes of soil-erosion control, the tunnel phenomenon presents a real nightmare to the farmer and the soil engineer. After the first rains, tunnels are sometimes formed in newly constructed soil embankments. On the other hand, in exceptional cases a dam wall may last for a period of four or even twenty years and then suddenly and unexpectedly be undermined by a tunnel draining the whole dam.

In new soil embankments tunnels usually develop only in cases where the soil has not been firmly tamped, with the result that there are too many air spaces in the wall. In practice it is not so easy to prevent this condition, since so much depends on the optimal amount of moisture required by every type of soil to become firmly tamped. It is wellnigh impossible for the farmer to keep the soil moisture optimal and to obtain the proper firmness, especially in the Vlekpoort soils where stamping causes them to become powdery if they are too dry, and clayey if they are too moist.

In practice, the best expedient is to mix the naturally brackish soils with as much as 50 per cent. of sand or fine gravel when a dam is scraped. This mixture does not actually control the optimal moisture content, but it may be regarded as a good "anti-tunnel" material since, amongst other things, it hampers the expansion and contraction of the soil.

Old existing dam walls made from brackish soil usually develop tunnels only when they have been dry for some considerable time. The reason is that these blackish soils expand or swell out if water is absorbed and remain in this condition until it dries and contraction takes place, causing fine invisible cracks. With only 10 points of rain, tunnels will be caused in this type of dam, since very little water is needed to filter through the highly erodible soil and in this way form a tunnel large enough to cause the whole wall to collapse.



FIG. 3.—The same as fig. 2, seen from a different angle.

In plastered or concrete weirs with cores in the soil embankments, care should be taken that good "anti-tunnel" material is joined to the cores and shoulders, otherwise the first floodwaters may



FIG. 4.—A tunnel connecting two large dongas.

carry out unbelievable stunts and cause what is known by the local farmers as a "pump" around the core. This so-called "pump"

The Farm Home.

(A section devoted mainly to the interests of Farm Women.)

The Knitting of Men's Socks.

Mrs. N. M. Seegers, Home Economics Officer, Department of Agriculture.

THE various steps to be followed when knitting men's socks, are given below, and those who carry out the instructions in detail, should experience very little difficulty.

Casting on the Stitches.

A point to remember in casting on the stitches for socks, is that the edge must be strong, yet elastic. The best methods of casting on are the following:—

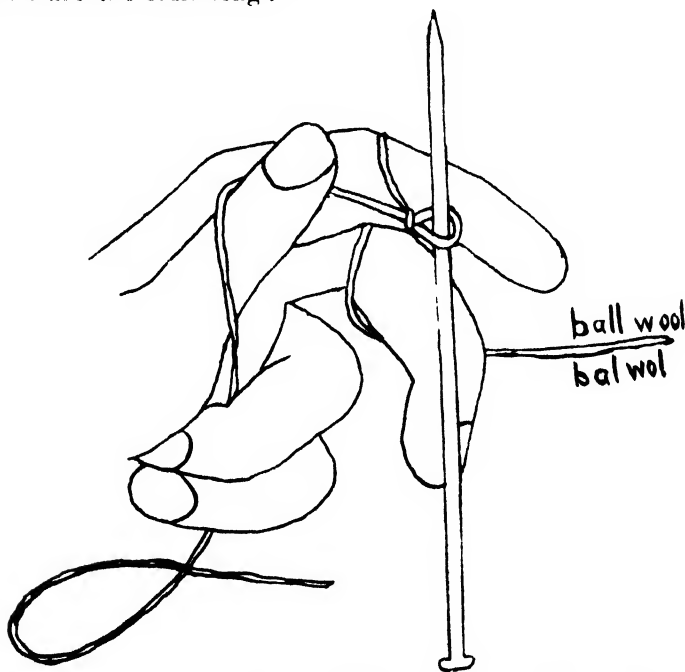


FIG. 1.—How the knitting needle is pushed through the loop.

(1) *Hand method.*—Leave a piece of wool long enough for the number of stitches to be cast on, and make a loop. Holding the knitting needle in the right hand, push it through the loop (fig. 1). Hook the loose piece of wool over the thumb of the left hand, and draw the other end from the ball of wool over the forefinger. The stitches are then caught through the loop at the thumb and put onto the needle (fig. 2).

(2) *With two needles.*—To cast on with two needles, make a loop at the end of the wool, knit into the loop and bring each stitch which has been knit, back onto the needle. Instead of putting the

needle through the first stitch, it is pushed between the two front ones. Each stitch is then hooked in this way and put back on the needle (fig. 3).

The right side of the cast-on stitches is the side facing the knitter after they have been cast on. The first row is knitted and the stitches are then divided equally on three needles so that the right side of the cast-on row is on the outside.

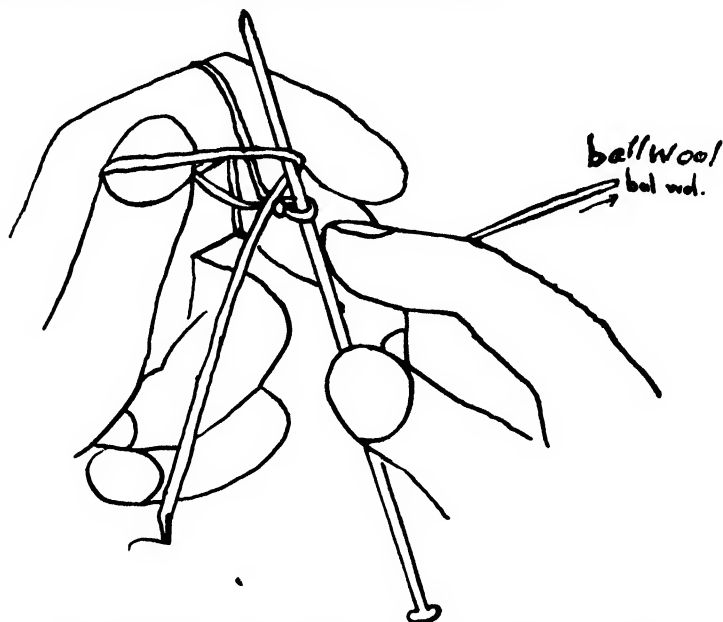


FIG. 2.—How the stitches are caught through the loop and cast on to the needle.

In order to obtain a loose and elastic edge, the stitches may be cast on with thicker needles than those with which the sock is knitted. For extra strength, a thread of sheen may be knitted into the ribbing, which must be from $3\frac{1}{2}$ to 4 inches long, and a suitable pattern is 2 plain, 2 purl. In order to ensure that

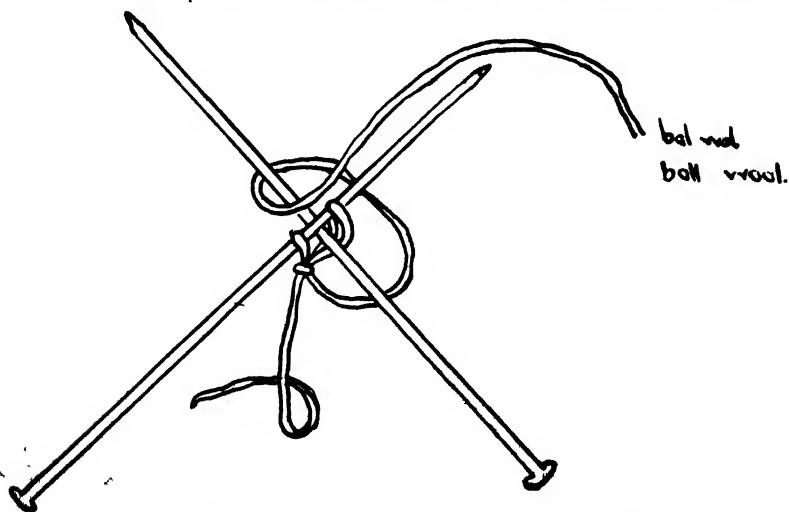


FIG. 3 Casting on with two needles.

KNITTING OF MEN'S SOCKS.

the ribbing retains its shape and does not stretch, knit into the back of the plain stitches.

The Leg.

Suitable patterns.—Stocking stitch or any plain ribbing is suitable. Elaborate patterns, especially thick designs, cross-ribbing or open designs are not suitable for men's socks. If ordinary stocking stitch is used, the leg must be shaped at the back. After completing the ribbing, continue for about $3\frac{1}{2}$ inches, and then shape by decreasing at both sides of the centre back. Knit two stitches together on either side of the centre back so that three stitches remain between the decrease. Knit a further half an inch, and decrease again. This is repeated twice, so that there are three decreases at the back of the leg, $\frac{1}{2}$ an inch apart. If the pattern is ribbed, it is unnecessary to decrease, as the ribbing is sufficiently elastic. The length of the leg from the cast-on edge to the beginning of the heel should be from 9 to 10 inches. See that you keep the beginning of the row at the centre back.

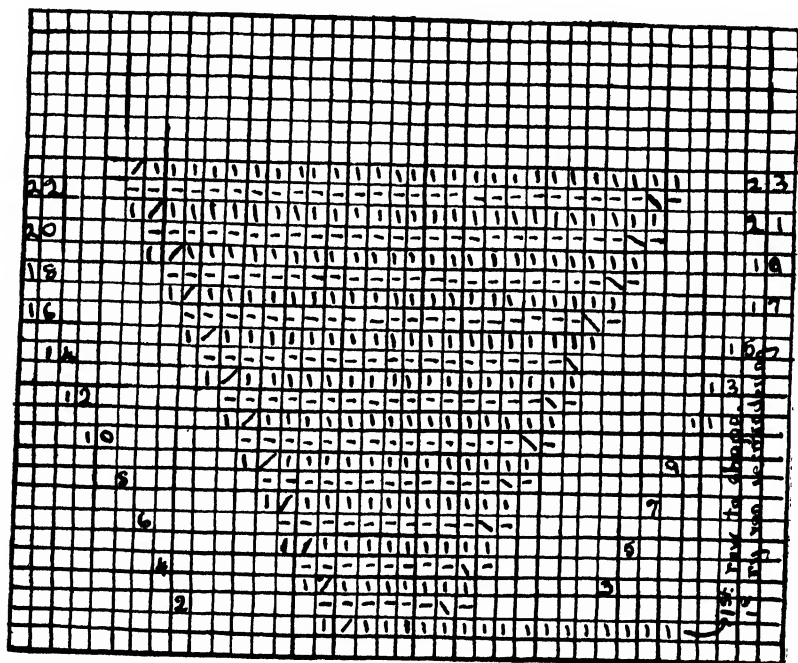


Fig. 4. THE FRENCH HEEL.

1 = Knit plain.

— = Purl.

/ = K. 2 together.

\ = P. 2 together.

Cable pattern for the leg.—The following is a very suitable pattern:—

A cable runs down either side of the sock and the rest is knitted in stocking stitch. First knit a ribbing of $3\frac{1}{2}$ to 4 inches long. Use 7 stitches on either side for the cable, viz. 1 purl, 5 plain and 1 purl. Knit four rows, and then make the first cable. On the one side the cable is knitted as follows: Leave 2 stitches on a spare needle, bring them to the front, and knit 3 stitches; then knit the two stitches on the spare needle. On the other side the cable is made

as follows: Leave 3 stitches on a spare needle, bring them to the back of the work and knit 2 stitches; then knit the three stitches on the spare needle. Make a cable every 5th, 6th or 7th row. Repeat until the sock is 10 to 11 inches long. Remember to decrease at the centre back. The top purl stitches of the cables are carried through to the beginning of the toe.

The length of the leg also depends on the size of the foot. Always bear in mind that when the sock is folded at the heel, the foot should overlap $\frac{1}{2}$ an inch of the lower part of the ribbing.

The Heel.

Divide the stitches in half, keeping the beginning of the rows in the centre of the needle on which the heel is to be knitted. See that you have an even number of stitches. Knit the one half of the stitches on which the heel is to be made, double. Do this in the

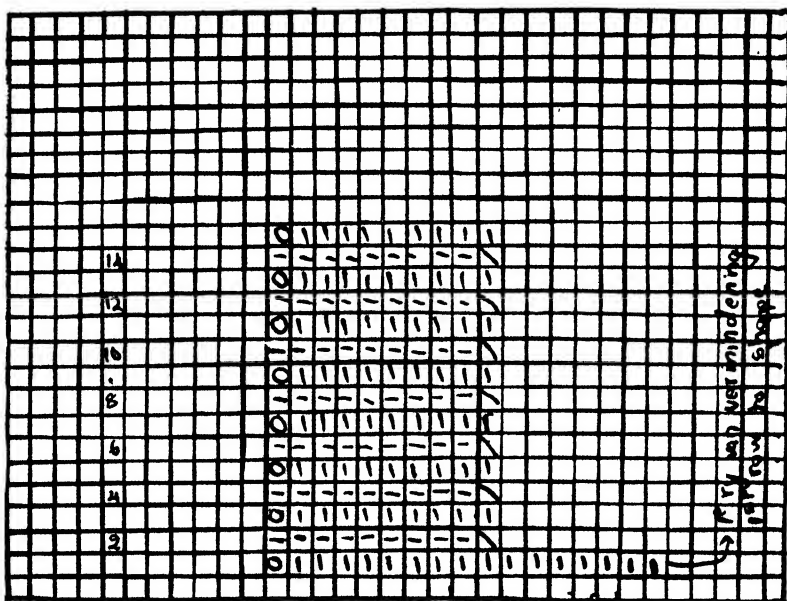


Fig. 5. THE DUTCH HEEL.

O=slip 1, knit 1, pass slipstitch over.

\=purl 2 together.

l=knit plain.

—=purl.

following manner: With the right side facing, slip 1, knit 1 to the end of the row; with the wrong side facing, purl throughout. Remember always to slip the first stitch. Continue until the heel is $2\frac{1}{2}$ inches long, or until a square is formed.

Turning of the Heel: Two Methods.

(1) *French heel*:—(fig. 4). With the right side facing, continue as follows:—

1st Row—plain:—Slip 1, knit to the middle of the row, knit 2, knit 2 together, knit 1, turn.

2nd Row—purl:—Slip 1, knit 5, knit two together, knit 1, turn.

3rd Row—plain:—Slip 1, knit to one stitch this side of the hole, knit 2 together, knit 1, turn.

4th Row—purl:—Slip 1, knit to one stitch this side of the hole, knit 2 together, knit 1, turn.

KITTING OF MEN'S SOCKS.

Repeat the 3rd and 4th rows until all the stitches have been knitted. With the right side facing, the stitches along the side of the heel are picked up. See that you pick up half as many stitches as there are rows in the heel. Knit across the foot and pick up the same number of stitches. Knit to the beginning of the row. Knit one row. Now decrease along the sides.

(2) *Dutch heel*:—(fig. 5). After the heel has been divided in two and is $2\frac{1}{2}$ inches long, it is turned. Knit two-thirds of the stitches. Let us suppose there are 24 stitches; then knit 16. Slip the following stitch, knit 1, pass the slipped stitch over and turn. Slip the first stitch and purl the following 8 stitches. Purl 2 together. Turn and slip the first stitch. Repeat until all the stitches are on one needle. Pick up the stitches along the side, knit across the foot, pick up the stitches along the other side and knit to the back where the rows commence. Knit one row.

Decreasing along the side of the foot.—Knit till three stitches are left on the first needle. Knit 2 together, knit 1. Knit across the foot (i.e. the second needle). Knit 1, slip 1, knit 1, pass the slipped stitch over, knit to the end of the row. Knit one or two rows of plain without decreasing. Repeat the two (three) rows until you

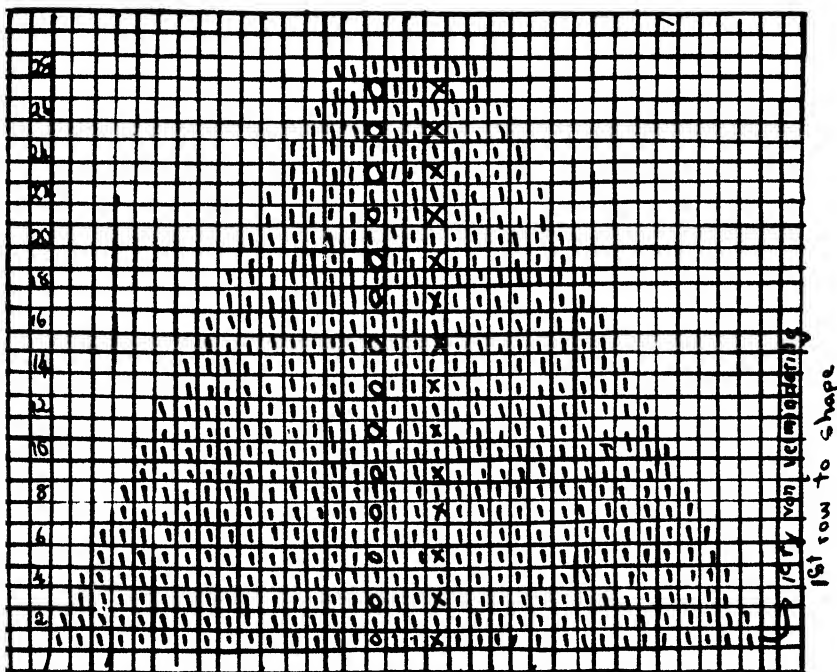


Fig. 6. THE TOE.

X = knit 2 together.

O = slip 1, knit 1, pass the slipped stitch over.

1 = knit plain.

have the original number of stitches left. The decreases must be spaced in such a manner that the foot and the leg of the sock will lie flat and not bulge. Knit the foot until it is about 2 inches shorter than the desired length. Now shape the toe, as this is about 2 inches long.

The Toe.

Knit to the last three stitches of the first needle, knit 2 together, knit 1. (fig. 6). Commence the second needle by knitting 1, slipping 1, knitting 1 and passing the slipped stitch over. Knit till three

stitches remain, knit two together, knit 1. Commence the third needle by knitting 1, slipping 1, knitting 1, passing the slipped stitch over. Knit to the end of the row. Knit one row without decreasing. Repeat these two rows until 5 to 7 stitches are left on the first needle, 10 to 14 on the second needle and 5 to 7 on the third needle. Knit the stitches from the first needle onto the third needle, so that only two needles are left with 10 to 14 stitches on each. The tip of the toe should not be broader than $1\frac{1}{4}$ to $1\frac{1}{2}$ inches.

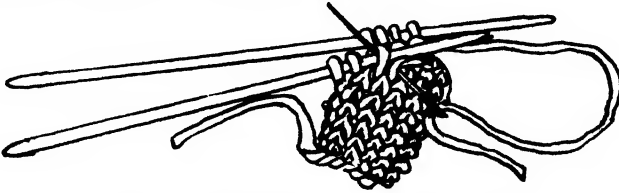


FIG. 7.—Grafting the toe of the sock.

Grafting of the toe (fig. 7).—Break off the wool about 6 inches from the work and thread it through a bodkin (or needle with a blunt point). Hold the work in such a manner that the thread is on the right-hand side of the work. Commence the grafting of the toe in the following manner: The purl side of the back needle and the plain side of the front needle face the knitter. Insert the needle plainwise into the first stitch on the back needle, but do not take it off. Insert the needle purlwise into the first stitch on the front needle, but do not take it off. Take off the back stitch purlwise and insert the needle plainwise into the following stitch, but do not take it off. Take off the front stitch of the front needle plainwise and insert the needle purlwise into the next stitch, but do not take it off. Continue in this manner until the whole toe has been grafted. Thus, the needle is inserted twice into each stitch and the stitch removed after the needle has been inserted the second time. When this method is followed, the stitches are grafted according to the loops—consequently there will be no seam. Do not pull the thread too tightly when grafting, as this will cause a ridge.

After the stitches have been grafted in this manner, the needle is pushed through to the wrong side and the thread sewn in, in the direction of the stitches. The same is done at the cast-on-edge.

Holes along the heel.—There should be no hole at the heel or toe of the sock. If one has been formed, however, it may be rectified by picking up one of the threads with a knitting needle, drawing it taut, and then sewing in the loose thread.

The two socks should be identical in all respects. The tension of the wool must, therefore, be the same throughout to ensure that the lengths will correspond when the rows are counted.

Ground Tunnels in the Vlekpoort Valley:—

[Continued from page 686.]

is nothing but a strong percolation of water and the beginning of a tunnel. In the case of weirs, especially, where ordinary sheets of corrugated iron are used as moulds for the concrete, the corrugations in the concrete should be taken into account since they provide an excellent opportunity for ordinary brackish soils to form a filter or "pump" all along one or more of the grooves as the soil ~~concrete~~ and draws away from the concrete. In such cases a good gravel mixture should be tamped down firmly along the shoulders and the

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Price Review for June, 1947.

Fruit.—Large quantities of green and inferior papaws were disposed of at fairly low prices. Pineapples were also well represented, but avocado's and guavas, which were of inferior quality, were offered in limited quantities. Lemons and naartjies were offered in large quantities, but grape-fruit was scarce. Consignments of oranges, however, decreased gradually during the second half of the month, and experienced a strong demand. Apples were plentiful and the demand moderate.

Tomatoes.—Large offerings of tomatoes came on to the markets and price reductions took effect. On the Johannesburg market the prices of National Mark No. 1 tomatoes fell from 7s. 4d. to 5s. 2d. per tray, and ordinary tomatoes on the Durban market from 2s. 5d. to 1s. 11d. per tray. On the Cape Town market, however, the prices of ordinary tomatoes increased from 2s. 10d. per tray in May to 4s. 4d. per tray in June, particularly as a result of a larger demand.

Potatoes.—Although the markets were still well supplied with potatoes, the supply decreased, however, and prices increased still further. For example, on the Johannesburg market, the prices of Transvaal potatoes, Grade 1, increased from 12s. 8d. to 17s. 4d. per bag; those of Natal potatoes on the Durban market from 17s. 8d. to 18s. 7d. per bag; and those of Cape potatoes on the Cape Town market from 18s. to 21s. 11d. per bag.

Onions.—Good quantities of onions were offered and prices remained high throughout. On the Johannesburg market the supply

consisted chiefly of Cape onions. Only limited quantities of Transvaal and Orange Free State onions were available during the first half of the month.

Vegetables.—Cabbage, cauliflower, carrots, green beans and pumpkins were plentiful and prices low. Good quantities of gem squashes and marrows were disposed of at satisfactory prices. Cucumbers and green peas were, however, scarce and expensive.

Fodder.—Lucerne was scarce and prices high. The quality was generally poor. Limited consignments of teff, which were also of poor to medium quality, also realized high prices. Green barley was well represented, but green lucerne was scarce, and was disposed of at satisfactory prices.

Eggs and Poultry.—The egg supply was small at the beginning of the month and prices high. Further decreases in the maximum wholesale and retail prices of eggs were announced during the course of the month. The supply was, however, considerable after the price decreases, but the demand limited. Moderate quantities of poultry realised high prices throughout.

Index of Prices of Field Crops and Pastoral Products.

The above index, which appears elsewhere in this issue, decreased from 206 during the previous month to 203 in June 1947. The index increased from 170 for the 1945/46 season to 198 for the 1946/47 season, particularly as a result of the increase in wool prices, as well as, but to a lesser extent, those of poultry and poultry products.

The most important changes occurred in the following groups for June, 1947:—

- (a) " Hay " increased from 166 to 169 due to a small increase in the prices of lucerne and teff.
- (b) " Other Field Crops ", i.e. potatoes, onions, sweet potatoes and dry beans show an increase from 187 to 213 as a result of the increase in the prices of potatoes, onions and dry beans.
- (c) " Pastoral Products " decreased from 192 to 174 owing to a decrease in the prices of wool.
- (d) " Dairy Products " increased from 194 to 247 due to the increase of the winter premium on butterfat and cheese-milk and the increase in the producer's price of condensing milk.
- (e) " Slaughter Stock " increased from 183 to 186 as a result of a special premium on slaughter cattle.
- (f) " Poultry and Poultry Products " show a decrease from 318 during the previous month to 291 in June, 1947 as a result of a decrease in the prices of eggs.

Leaf Tobacco Prices for the Season 1947/8.

In order to compensate producers for the increase in the cost of production of leaf tobacco since the previous crop, and to

CROPS AND MARKETS.

encourage production still further, the Government decided to increase the "plus" percentage which has been added to the basic prices of leaf tobacco by a further 10 points, viz. from 55 per cent. to 65 per cent. for the season 1947/48. It was also decided to increase the basic price of all grades of dark air-dried tobacco by 1d. per lb.

The following table shows the weighted average prices as from the 1939/40 season until and including the 1947/48 season for the three classes of leaf tobacco, viz. kiln-dried, light air-dried and dark air-dried leaf tobacco.

	Kiln-dried.		Light Air-dried.		Dark Air-dried.		Average all Three Classes.	
	d. per lb.	Index.	d. per lb.	Index.	d. per lb.	Index.	d. per lb.	Index.
(a) Basic Prices.—								
1939-40.....	18.3	100	12.2	100	8.2	100	13.3	100
1942-43.....	19.6	107	14.6	119	8.2	100	14.4	109
1943-44.....	19.6	107	14.6	119	8.7	106	14.6	110
1947-48.....	19.6	107	14.6	119	9.7	118	14.0	112
(b) "Plus" percentages.—	Percent		Percent		Percent.		Percent.	
1940-41.....	15		15		7½		13	
1941-42.....	15		22½		7½		15	
1942-43.....	20		22½		15		19	
1943-44.....	35		35		35		35	
1944-45.....	40		40		40		40	
1945-46.....	45		45		45		45	
1946-47.....	55		55		55		55	
1947-48.....	65		65		65		65	
(c) Basic Prices plus "Plus" percentages—	d. per lb.	Index.	d. per lb.	Index.	d. per lb.	Index.	d. per lb.	Index.
1939-40.....	18.3	100	12.2	100	8.2	100	13.3	100
1940-41.....	21.1	115	14.1	115	8.8	108	15.1	113
1941-42.....	21.1	115	15.0	122	8.8	108	15.3	115
1942-43.....	23.5	128	17.8	146	9.4	115	17.2	129
1943-44.....	26.5	145	19.7	161	11.7	143	19.7	148
1944-45.....	27.5	150	20.4	167	12.2	149	20.5	154
1945-46.....	28.5	155	21.1	173	12.6	154	21.2	159
1946-47.....	30.4	166	22.6	185	13.5	164	22.6	170
1947-48.....	32.4	177	24.0	197	16.0	195	24.6	185

As indicated in the above table, tobacco prices have been continuously increased since the first price fixation in 1939. The further increase of 10 points in the "plus" percentage together with the increase of 1d. in the basic price of dark air-dried tobacco, therefore, results in a price increase of 85 per cent. for the three classes of leaf tobacco, viz. 77 per cent. for kiln-dried, 97 per cent. for light air-dried and 95 per cent. for dark air-dried, compared with 70 per cent. during the past season.

The Production of Tobacco.

The following table shows the total quantity of leaf tobacco which was handled annually by tobacco co-operatives as from 1937 until 1946.

Average.	Kiln-dried.		Light Air-dried.		Dark Air-dried.		Average all Three Classes.	
	'000 lb.	Index.	'000 lb.	Index.	'000 lb.	Index.	'000 lb.	Index.
1937-39.....	4,494	100	5,325	100	12,426	100	22,245	100
1940.....	10,180	227	7,422	139	17,837	144	35,448	159
1941.....	7,719	172	6,085	113	9,392	76	23,146	104
1942.....	9,459	210	6,710	126	7,775	63	23,944	108
1943.....	10,569	235	8,595	161	12,460	100	31,630	142
1944.....	8,508	189	6,231	117	9,285	75	24,024	108
1945.....	13,774	306	9,272	174	8,727	70	31,774	143
1946.....	12,766	284	6,222	117	9,416	76	28,404	128

From the above table it appears that a big expansion in the production of kiln-dried tobacco has taken place since 1939 and a moderate increase in that of light air-dried leaf tobacco, while the production of dark air-dried tobacco declined markedly.

Maximum Prices of Eggs.

THE maximum wholesale and retail prices of eggs in controlled areas, as fixed on 11 April 1947, were decreased by 6d. per dozen on 20 June 1947, and by 3d. per dozen on 27 June 1947. On 4 July wholesale and retail prices were further decreased by 3d. and 4d. per dozen respectively. On 11 July 1947, prices were decreased by 5d. per dozen all round. Prices are now as follows:—

		MAXIMUM PRICE PER DOZEN.	
		Wholesale	Retail.
		s. d.	s. d.
Grade I	(a) Large.....	2 6	2 9
	(b) Medium.....	2 4	2 7
	(c) Small.....	2 2	2 5
Grade II	(a) Large.....	2 4	2 7
	(b) Medium.....	2 2	2 5
	(c) Small.....	2 0	2 3
Grade III Mixed.....		2 1	2 1

The maximum price of eggs in the uncontrolled areas has been fixed at 2s. 6d. per dozen. See Government Gazette Extraordinary of 11 July 1947.

The maximum prices of liquid eggs in the Union as fixed on 25 February 1944 were discontinued as from 27 June 1947. See Government Gazette Extraordinary of 27 June 1947.

Review of the Wool Market During June, 1947.

DURING June 1947 a total of 25,534 bales of wool was offered for sale at auction in Union ports, and 14,684 bales (59 per cent.) were sold. In comparison with May the quantity sold decreased by 6 per cent. Prices were generally steady.

The demand was keen for free washing shorts, combings, medium and outsorts. There was also a demand for Native wool of fine quality. Karakul wool was ignored. Further sales will again take place in September with the commencement of the new season.

The Cape Onion Crop for the 1947 Season.

ACCORDING to estimates the Cape onion crop for the 1947 season is from 25 per cent. to 30 per cent. smaller than that of the previous season, when a very good crop was harvested. Plantings were about the same as those of last year, but drought during the growing period and anthracnose generally damaged the crop because bulbs could not mature as in the case of the 1946 crop.

The Prices of Onions.—As will be seen from the table on onion prices which appears elsewhere in this issue, prices are generally low at the beginning of the year. This is accounted for by the large supply of loose onions that comes on to the market after the lifting of the Cape late crop. Onions that are not free from their stems, are hung in bunches and kept for the better prices that rule during the scarce period, i.e. the second half of the year. Prices gradually increased from 14s. per bag (120 lb.) for Cape onions on the Johannesburg market in January 1947 to 26s. 9d. per bag for June. Prices will probably rise still further until the Transvaal early crop is marketed about November.

Agricultural Conditions in the Union During June, 1947.

Weather Conditions.—Light scattered showers occurred throughout the Cape Province, and fairly good showers in Natal and the eastern Orange Free State. The northern Transvaal, the lowveld and the north-eastern Orange Free State, however, had little rain, while the western Transvaal and the western Orange Free State had practically no rain.

Crops.—On the whole, the prospects for summer cereal crops, which are now being harvested, appear to be promising. In general, the prospects for winter cereal crops appear to be promising, but the crops urgently required rain.

Stock and Pastures.—Although the condition of stock and pastures was generally fair, the veld required soaking rains in some areas to assure sufficient winter grazing. On the highveld the condition of stock deteriorated, particularly as a result of the cold weather. Except for lumpy skin disease in the western and south-western Cape Province, the Transkei and Natal, and for nagana in Natal, stock diseases were quiet.

The Egg Purchasing Scheme.

A preliminary scheme was inaugurated in 1942 whereby the Director of Food Supplies was to buy all surplus eggs. Owing to the shipping position in that year it was regarded as unlikely that the export of the surplus production of Union eggs would be possible. The shortage of poultry feed and the increase in domestic consumption further promoted the introduction of control. Producers had to be protected against a steep price decline in the surplus season (July–October).

The Egg Purchasing Scheme was introduced by the Director of Food Supplies on 16 July 1943. Since then the egg surplus has been bought up by the Director during the plentiful season and placed in cold storage, over which he had full control. During the scarce season (February–June) cold storage eggs are sold at fixed prices and the scheme has been conducive to price stability to both producers and consumers.

In the following table the annual quantity of eggs purchased through the scheme is given:—

Quantities of Eggs Stored in Cold Storages under the Egg Purchasing Scheme.

Date.	Prices. (No. 1 large.)	Number of cases. (30 dozen eggs each.)
	s. d.	
1942/43.....	1 5	5,140
1943/44.....	1 8	134,777
1944/45.....	1 7	69,735
1945/46.....	1 8	108,954*
1946/47.....	1 9	77,312

* This includes 18,334 cases, which were exported to England, and delivered to the British Ministry of Food.

In the 1943-44 season all grades of eggs were purchased and 16,000 cases of these surplus eggs were converted into egg powder. Since the 1944-45 season only first grade eggs were purchased with the exception of a small quantity of inferior eggs, which were purchased under a guarantee of re-purchase.

A similar scheme will be introduced this year, and the intention is to buy first as well as lower grade eggs. First grade eggs will, with a view to export, be acceptable only if packed in new cases.

For the coming season the purchase price under the scheme will be 1s. 9d. per dozen for Grade 1, large eggs, which is 1d. higher than the previous year, in order partly to cover the increased production costs.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannesburg. Table.	Durban.	Cape Town.
1939-40.....	s. d. 8 3	s. d. 8 10	s. d. 7 4	s. d. 7 10	s. d. 8 6	s. d. 9 6	s. d. 5 7	s. d. 4 8	s. d. 5 3
1940-41.....	6 8	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1941-42.....	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1942-43.....	10 5	15 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1943-44.....	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1944-45.....	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1945-46.....	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1946-47.....									
January.....	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February.....	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March.....	11 4	12 4	9 9	12 10	12 9	13 5	18 5	14 3	14 6
April.....	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May.....	13 6	13 9	11 9	13 9	12 10	14 7	15 3	15 6	14 5
June.....	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 3	15 1
July.....	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August.....	14 9	17 0	13 7	15 10	20 6	18 7	15 10	16 0	18 3
September.....	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October.....	24 9	23 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December.....	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1947-48.....									
January.....	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 8
February.....	14 8	14 5	11 9	13 7	16 1	17 8	16 11	7 6	13 11
March.....	17 6	18 7	14 3	20 3	13 4	17 6	15 6	13 4	14 1
April.....	20 7	22 2	17 10	22 3	24 11	24 4	12 7	8 4	10 9
May.....	22 4	24 11	20 11	26 2	27 5	24 1	10 1	8 6	11 7
June.....	26 2	26 8	23 3	26 9	26 4	27 2	9 9	7 5	11 5

CROPS AND MARKETS.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johan- nesburg (a) 100 lb.	KAFFIROORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (a).		
	Cape.	Trans- vaal.			K1.	K2.	Speckled Sugar	Cow- peas	Kid- ney.
1938-39.....	s. d. 3 10	s. d. 3 1	s. d. 4 0	s. d. 2 7	s. d. 13 1	s. d. 12 9	s. d. 25 0	s. d. 16 9	s. d. 24 2
1939-40.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.....	4 2	3 5	4 8	3 8	15 6	17 0	30 0	16 8	27 11
1941-42.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 8
1942-43.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.....	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.....	6 4	5 4	7 2	4 9	18 8	18 8	38 7	39 6	70 6
1946—									
January.....	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February.....	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 8	69 4
March.....	6 2	5 5 8	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 8
May.....	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June.....	7 8	5 6	7 6	4 5	60 8	60 8	94 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1947—									
January.....	5 10	5 11	7 5	3 8	48 9	48 9	61 4	38 11	51 4
February.....	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 8
March.....	6 3	5 10	7 5	3 11	40 8	40 8	47 1	35 1	49 3
April.....	7 1	6 10	7 8	4 7	38 4	38 4	55 7	42 3	56 1
May.....	6 8	7 6	7 9	4 6	33 5	33 5	50 8	38 2	50 0
June.....	6 9	6 9	8 3	4 7	33 0	33 0	50 4	41 2	49 0

(a) Municipal Market.

(b) Seasonal year for kaffircorn.
1 June-31 May.

Dry Beans, 1 April-31 March,

Lucerne and teff, 1 July-
June.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Com- bined index.
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)		
WEIGHTS.	19	18	2	3	34	6	17	6	100
1938-39.....	92	109	96	89	79	102	106	94	93
1939-40.....	86	114	77	95	115	105	106	89	104
1940-41.....	108	120	106	156	102	108	110	103	109
1941-42.....	120	144	143	203	102	131	135	136	124
1942-43.....	160	157	144	159	122	147	168	167	147
1943-44.....	170	186	137	212	122	154	185	188	159
1944-45.....	183	186	160	281	122	177	179	184	164
1945-46.....	201	194	164	312	118	194	185	170	170
1946-47.....	241	209	149	232	169	205	192	204	198
1946—									
January.....	198	194	191	347	118	204	188	204	174
February.....	198	194	158	305	118	186	184	224	171
March.....	198	194	160	280	118	186	181	241	171
April.....	198	194	176	298	118	186	180	279	174
May.....	249	194	170	284	119	186	177	289	184
June.....	246	194	178	287	119	218	178	260	184
July.....	245	194	182	303	120	231	183	193	182
August.....	242	194	181	319	120	231	188	164	181
September.....	243	194	183	351	163	231	196	156	198
October.....	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December.....	242	210	157	236	168	194	208	201	200
1947—									
January.....	242	210	144	174	178	194	200	238	203
February.....	240	210	127	157	187	194	191	248	203
March.....	240	210	154	153	189	194	182	251	203
April.....	239	210	178	169	190	194	179	233	205
May.....	225	210	166	187	192	194	183	318	206
June.....	225	210	169	213	174	247	186	291	208

(e) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.

(d) Potatoes, sweet potatoes,
onions and dried beans.
(a) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and
condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (a)		
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.
1938-39.....	s. d. 1 8	s. d. 2 3	s. d. 2 0	s. d. 2 4	s. d. 1 9	s. d. 1 2	s. d. 3 8	s. d. 2 6	s. d. 6 1
1939-40.....	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	12 4
1940-41.....	2 7	3 10	2 6	3 11	3 8	3 4	8 5	8 11	17 2
1941-42.....	3 1	4 3	3 0	3 8	2 10	3 9	5 1	8 9	13 2
1942-43.....	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1943-44.....	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1944-45.....	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1945-46.....									
1946-47.....									
January.....	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February.....	1 11	—	2 3	6 5	—	6 4	7 8	7 11	14 1
March.....	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.....	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May.....	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June.....	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July.....	3 2	1 11	2 2	2 7	8 6	3 4	3 8	4 8	7 10
August.....	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.....	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December.....	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947-48.....									
January.....	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
February.....	4 2	—	5 1	3 2	—	5 8	10 4	—	12 8
March.....	3 5	—	2 5	5 3	—	7 5	16 8	20 0	24 5
April.....	2 7	2 5	2 1	6 7	5 1	7 8	13 4	4 11	27 1
May.....	3	3 3	2 5	9 0	4 0	4 8	8 10	18 8	23 8
June.....	2 11	3 4	4 3	5 9	4 4	3 7	7 1	17 11	16 7

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Prices of Avocados and Papaws on Municipal Markets.

SEASON.	AVOCADOS (Per Tray). (a)				PAPAWS. (b)					
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Elizabeth Std. Box.	Bloem- fontein Std. Box.
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.		
1938-39.....	s. d. 1 6	s. d. 0 11	s. d. 1 3	s. d. 1 11	s. d. 2 0	s. d. 0 10	s. d. 1 7	s. d. 2 0	s. d. 2 0	s. d. 1 8
1939-40.....	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6
1940-41.....	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9
1941-42.....	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0
1942-43.....	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0
1943-44.....	4 1	1 6	3 7	5 3	3 2	1 5	2 5	3 5	3 8	2 7
1944-45.....	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0
1945-46.....										
1946-47.....										
January.....	8 1	1 6	5 10	9 2	3 10	1 6	4 5	7 11	6 4	3 11
February.....	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 6	4 7
March.....	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8
April.....	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6
May.....	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2
June.....	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0
July.....	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11
August.....	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4
September.....	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11
October.....	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10
November.....	8 6	3 6	6 3	7 4	2 5	0 8	2 8	2 11	2 11	2 8
December.....	8 9	2 0	5 11	8 3	3 7	1 9	8 7	4 8	4 11	2 6
1947-48.....										
January.....	7 11	—	5 5	—	4 6	1 8	4 10	6 6	8 0	3 9
February.....	2 6	—	2 11	—	4 9	1 5	7 10	—	8 11	—
March.....	2 0	2 1	2 11	3 11	6 5	3 10	8 2	8 1	—	5
April.....	2 7	1 2	2 7	3 6	6 4	1 6	6 0	6 9	7 2	4 7
May.....	2 2	1 2	3 6	4 9	3 7	2 0	3 10	5 2	4 1	3 3
June.....	2 8	1 4	3 0	4 5	3 2	1 8	3 10	4 5	3 9	3 3

(a) Season 1 January to 31 December.

(b) Season 1 April to 31 March.

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[Photo on Cover: Merino Rams at Grootfontein Agricultural College, Middelburg, Cape.]

[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

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Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the Crops and Markets Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

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Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

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Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor Department of Agriculture, Pretoria.

D. J. SEYMORE Editor.

FARMING IN SOUTH ... AFRICA

Vol. 22

SEPTEMBER 1947

No. 258

Editorial:

Plant Diseases and South African Agriculture.

THE rusts, mildews, scabs, blasts, blights, smuts and wilts have smitten plants ever since man began to cultivate crops. They were recognized as a cause of famine even in biblical times, for, say the Scriptures, "If there be in the land famine, if there be pestilence, blasting, mildew . . . " (1 Kings 8:37); and down the ages they have brought hunger and misery with them. In 1845 potato blight crossed the Atlantic and reached Europe; and in the years from 1845 to 1860 a million people died in Ireland alone as a result of famine, and one and a half million emigrated. The rest of Europe, not being so dependent on the potato, escaped more lightly, but even so the blight made a grim contribution to the sufferings of the Hungry Forties. In 1917 an epidemic of rust in the wheat fields of North America contributed to the famines of the first World War; and it is only the constant watch being kept in wheat research laboratories and at breeding stations that has averted the threat of famines in bread as a result of the ravages of diseases, a threat which is no less serious than the hazard of drought.

Plant diseases to a very large extent stamp the pattern of agriculture on a country. A few examples will be chosen from many to illustrate this point. Wheat grows in hot climates provided that the air is dry; it grows in moist climates, if the weather is cool; but it is swept by disease when there is a combination of even moderate warmth and moisture in the air. Thus it happens that our summer rains, the greatest crop-producing asset in South Africa, cannot be used to produce wheat except on the cool mountains of Basutoland; and in the summer-rainfall area of the Union wheat is grown only in autumn, winter and spring—with irrigation, or often as a gamble without. Over most of the Union the potato quickly succumbs to inheritable diseases, which made the importation of fresh seed a regular feature in the past and left us vulnerable to shipping shortages during the war until a local seed industry could be established. Further, the potato in South Africa is very subject to blights from February onwards, in consequence of which the bulk of the commercial crop is produced during the first part of the season and the potatoes are on the way to staleness when winter comes. Diseases of groundnuts and sunflower in the Northern Transvaal, our most important area for oil-seeds, have to a considerable extent restricted production. Many years ago a thriving young coffee industry was wiped out by rust, and never revived. A few years ago a new fibre industry on the Zululand coast was destroyed beyond recovery by disease.

If by the waving of a wand it were possible to banish all plant disease from the country, there would be no need to import wheat; potatoes would not have been in such short supply during the war and would be fresher at all seasons; there would be more soap and oil; and we would successfully grow a range of crops far greater than at present.

Research into plant diseases, the breeding of new varieties resistant to disease, giving advice to farmers on the control of disease, prevention of the introduction of new diseases into the Union and the eradication of some diseases already introduced are the main lines along which the Department of Agriculture is working. Although progress is being hampered by the present shortage of staff, the Department of Agriculture is sure that the efforts of the plant pathologists and plant breeders will bring more abundant food in greater variety and better quality.

Not only should farmers know what is being done in this direction on their behalf, but they should also realize that they themselves can make a valuable contribution towards the achievement of effective control both by reporting immediately all cases which merit investigation and by applying methods which are known to be effective. Such mutual co-operation between farmers and the Department cannot but be productive of beneficial results.

(Dr. J. E. van der Plank, Division of Botany and
Plant Pathology.)

Weed-Free Lucerne, Teff and Grass Seed.

Sellers of lucerne, teff, rye-grass, Rhodes, Paspalum and Phalaris grass seeds are reminded that in terms of the requirements of the "Seed Act", No. 21 of 1917, the purity and germination capacity of these seeds should be stated in advertisements and be given on labels attached to containers when declared seed is offered for sale.

In terms of Section 8 of the Weeds Act, No. 42 of 1937, it is necessary to state that lucerne seed is free from dodder seed, and that teff and rye-grass seed are either free from nut-grass (uintjies) and sheep-sorrel seed, or that they do not contain more than $\frac{1}{2}$ per cent. of these proclaimed weed seeds.

Further particulars and copies of the relevant regulations are obtainable from the Seed Analyst, c/o College of Agriculture, Potchefstroom.

Groundnuts.

J. Sellschop, Experiment Station, Potchefstroom.

GROUNDNUTS or peanuts (*Arachis hypogaea* L.), also popularly known in South Africa as monkey nuts, are among the world's leading oil and protein crops. Formerly they were grown by a few native tribes. Some definitely despised them. Now they are being cultivated extensively by Europeans. A greater use of groundnuts in the diet would prove beneficial to the health of the population. They also yield considerable quantities of easily-cured protein-rich hay. Their roots are highly resistant to eelworm (*Heterodera marioni* Cornu) which is often troublesome on potatoes and on the roots of tobacco and tomato plants. Furthermore, they are not affected

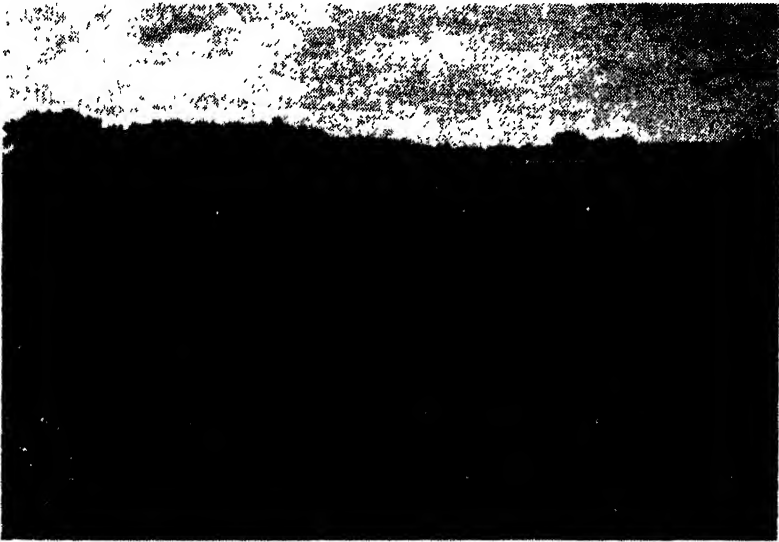


FIG. 1.—Groundnut plants in rows spaced 3 feet apart.

[Photo : Dr. A. R. Saunders.]

by the witchweed of maize. They have their own plant parasite, however, which, fortunately, is seldom seen in the Union, but for which a careful watch should always be kept.

Climatic Requirements.

For profitable production it is essential that groundnuts be grown on a sufficiently large scale in well adapted areas, so that the necessary picking, shelling and marketing facilities may be provided for. As groundnuts are sensitive to frost and long spells of cold weather, they cannot be considered a safe, or regular, crop in the cooler highveld districts. Under irrigation they do remarkably well. On drylands an evenly distributed summer rainfall of at least twenty two inches per annum is required, but they can do with less if the fall is largely concentrated over the growing season, say from November to February. In mist-belt areas the plants are often troubled by leaf-spot (*Cercospora* spp.) and other diseases.

Recommended areas are (1) Natal, with the exception of the districts of Impendhle, Ixopo, Richmond, Kranskop, Bulwer, Underberg, Lions River and Babanango; (2) the Transvaal, except the

extreme south-eastern highveld and extreme south-western districts; (3) the north-western Orange Free State; and (4) the irrigated areas of the Vaal-Hartz and Orange rivers.

Picking Facilities.

Unless an ample supply of labour is available, picking machines for the removal of the nuts from the plants will have to be provided where large quantities of nuts are to be grown. A machine capable of picking from 200 to 300 bags of nuts per day would suffice for, say, every 100 bags of seed planted, or for 350 morgen under this crop. There are different makes and sizes of picking machines regarding which information should be obtained from agricultural-implement merchants.

Shelling.

The current increase in the demand for groundnuts is for the shelled kernels. Only a relatively small portion of any year's crop can be disposed of in the unshelled state. Moreover, considerable saving in transportation costs, bags and storage space can be effected,



FIG. 2.—Top : Virginia Bunch seed, shelled and unshelled. Bottom : Natal Common seed, shelled and unshelled.

[Photo : F. X. Laubscher.]

and the crop more readily disposed of, if shelling facilities are provided by individuals or by groups of producers. Several types of shelling machines are advertised in the agricultural press from time to time. They are not difficult to make. Some may be mounted on the larger types of power-driven maize threshers, so that the screens and winnowers of the latter can then be used for the cleaning and sizing of the kernels.

Soil Requirements.

Groundnuts do well on a variety of soils. Sandy soils are not essential. Unless several well-fertilized crops have been grown on them, they often lack fertility and frequently produce many poorly filled pods. Well-drained friable loamy soils which are in a good physical condition, well supplied with decomposed organic matter

GROUNDNUTS.

and which contain some lime, are the best. Heavier soils produce large yields of nuts, but difficulties in cultivating and lifting of the nuts are factors which make them less suitable. Sticky clays should be avoided. Some soils stain the pods, but this is of no consequence now that such a large proportion of the crop must be used in the shelled state. Newly broken virgin soils which still contain considerable amounts of undecomposed organic matter cannot be recommended, and particularly so if the crop is to be planted very early in the season. Once they are in good tilth, warm and moist, they are most suitable for this crop. On soils which are inclined to "blow", the young groundnut plants have been found to suffer far more than maize and other crops. They will also not thrive on nut-grass "uintjie" or quick-grass infested soils.

In areas with an undulating topography groundnuts should preferably be planted on sites that have a northern or western aspect. Such sites are generally warmer and drier than those facing east and south and on them less trouble from leafspot may be expected.

Special Need for Crop Rotation.

For the continued successful production of groundnuts, it is most essential that a carefully planned system of crop rotation be



FIG. 3.—The foot-rot fungus, *Sclerotium rolfsii*, on a maize stalk.

[Photo : F. X. Laubscher.]

followed. The plants have a small root system, most of which is removed from the soil in the lifting or harvesting process. Unless they are grown in rotation with plants which leave more organic matter behind than themselves, there is likely to be a serious lowering of the humus content of the soil, with a consequent adverse effect on its physical structure. If suitable fertilizers are not applied at the same time, an undesirable balance between the availability of different soil nutrients may also set in. In South Africa, as in other countries, the continuous cropping of the same soils to groundnuts has been responsible for marked reductions in yield and a serious increase in the incidence of certain diseases, e.g. foot-rot.

As far as possible, groundnuts should be grown in rotation with crops that have extensive root systems, such as maize, kaffir-corn and millets, or ones which leave considerable residues of organic matter and which decompose very readily, such as sunflowers and sunn-hemp. The value of sunflowers as a crop to precede groundnuts has been amply demonstrated by the Salisbury (Rhodesia) Agricultural Experiment Station. Since the greater portion of the heavily nodulated roots of the groundnut plants are removed from the soil, a

Carefully planned rotation also calls for another legume, which, apart from the nitrogen it can bring into the soil, will, with its generally limited root system, allow time for the more complete decomposition of the residues left by gramineous plants. Whatever the crop rotation system that may be decided upon, it is imperative that the stubble and trash of *each and every* crop in the system should be ploughed in as soon as it has been harvested, in order to permit of their rapid decomposition, otherwise the groundnut foot-rot fungus (*Sclerotium rolfsii* Sacc.) which is often *naturally present* as a scavenger in some of our warmer bushveld soils, may multiply, under favourable weather conditions, on the coarse trash left on, or near, the soil surface. This applies in particular also to groundnut residues. In the eastern Transvaal lowveld and along the Natal coast, where bacterial wilt often occurs, groundnuts should not be grown in close rotation with other susceptible crops such as tomatoes, potatoes and brinjals. There the more resistant Natal Common types may be grown in preference to the Virginia Bunch.

Fertilizer Requirements.

Only a small amount of investigational work has so far been done in South Africa on the fertilizer requirements of groundnuts. There



FIG. 4.—Top: Healthy seedlings from treated seed. Bottom: Seedlings from untreated seed. [Photo: C. Haagner.]

are indications that the crop responds to applications of kraal manure, superphosphate and lime; even on soils containing considerable amounts of calcium. In one instance potassic fertilizers caused a slight depression in the yield of nuts.

In other countries the experience with regard to fertilizers has generally been varied and conflicting. Though Anna Pettit found in 1893-95 that the young nuts, or gynophores, are capable of taking up nutrients through the hairs with which they are covered at certain stages, it was only towards 1945 that the North Carolina Experiment Station showed that it was of considerable importance as to whether different fertilizers were placed in that region of the soil where the roots or nuts are generally formed.

GROUNDNUTS.

Under present conditions the following suggestions are made. The fertility of soils intended for groundnut production should be kept at a high level by applying fertilizers to preceding crops. On *new soils* superphosphate may be applied at the rate of 300 to 500 lb. *per morgen* and worked in shallow. On naturally poor or exhausted soils, applications of 10 to 12 tons of kraal manure and 300 to 500 lb. of superphosphate may be made. Where manure is not available, fertilizer mixtures C (2:12:2) and D (3:13:3) may be used when obtainable. To soils deficient in lime applications of one to two tons of agricultural lime may be made as a surface dressing. On sandy soils which regularly produce a large percentage of blank pods, dolomitic limestone should be tried, as a lack of magnesium is sometimes responsible for this condition. The general fertility of the soil, particularly the organic matter content, spacing of the seed and the variety planted, should also be inquired into when blank pods occur.

Apart from being broadcast and ploughed, harrowed or disced into the soil, the fertilizer may be scattered in wide bands along the rows on the soil surface, or be placed in narrow bands in the soil near the seed. The seeds are easily injured by fertilizers so that they should not be in contact with the latter. Fertilizers may be appropriately placed by means of potato fertilizer distributors or the newer types of attachments which can be fitted on maize planters. South African tests have shown that even those fertilizers which readily injure seeds, may be safely placed two or three inches to either side of groundnut seed provided excessive amounts are not used.



FIG. 5.—A farmer's transportable combined picking machine and hammermill—
Settlers, Transvaal. [Photo : R. Dykema.]

The present (1947) fertilizer position does not permit of a special allocation being made for groundnuts.

Varieties.

There are numerous varieties and strains of groundnuts. Many have been systematically tested for a number of years at several experiment stations in the Union, but owing to the limitations of our peculiar climatic conditions, varieties other than the Virginia Bunch and Natal Common cannot be recommended at present. Moreover, large quantities of seed of other suitable varieties are not available yet.

The breeding of, as well as the search for, better types is being continued at the Potchefstroom and other experiment stations.

The Virginia Bunch (Valencia) is the one more generally grown. It matures in about 120 to 130 days and, on account of its three and four-kernelled pods and thick soft shells, is very popular in the roasting trade.

The Natal Common (Small Spanish) matures in about 140 to 150 days, depending on the planting time and season. It produces more flowers, is less subject to adverse soil and climatic conditions and consequently has often a higher yielding capacity than the Virginia Bunch. Both sprout if they are left in wet soil after they have matured. Notwithstanding its numerous, small, two-kernelled pods, the Natal Common can be as effectively picked by machines as the Virginia Bunch; but it is often objected to when the picking has to be done by hand. In soils lacking organic matter a considerable amount of sand generally packs on to the closely bunched Natal Common pods. When over-ripe, the Natal Common peduncles or nut stalks do not break as easily as those of the Virginia Bunch.

Natal Common seed must be treated with particular care, as it splits readily when the testa dries out or if it is roughly handled in transit.

Since bacterial wilt (*B. solanacearum* E.F.S.) often causes considerable damage to the Virginia Bunch in the warm Transvaal lowveld and along the Natal coast, the less susceptible Natal Common and similar strains and varieties, e.g. Gudiyatham Bunch, should be the main types grown there.

Observations made over several years have not shown that Natal Common and Virginia Bunch differ regularly in their susceptibility to leafspot. Neither is there good reason to hold that the one is more resistant to root-rot than the other.

Other Varieties.

However attractive the large-podded varieties such as San Mateo (Giant Natal) Jumbo and Rustenburg may be as regards their outside appearance, their kernels are often chalky and immature. They can therefore not be graded and valued on the same basis as the Virginia Bunch and Natal Common. They require a long, warm and moist season. In high-elevation areas and areas with cold nights, they are, according to experience, generally not able to form many mature kernels.

Seed.

For successful production, groundnut fields should be evenly and closely covered by the plants. If the plants are too far apart, the unshaded soil between them may become unduly warm for the developing pods during continuous dry weather. Furthermore, the wingless predators of the vectors of the rosette virus disease cannot move easily over plants that are not in close contact with each other. This disease, as well as heavy aphid infestations, can often be seen in sections of fields where the plants are sparsely or irregularly spaced, or where soil conditions hamper the full development of the plants. The coverage obtained is largely dependent on the quality of the seed used. Unless care is taken from the shelling to the planting stage, the seed is likely to be the primary cause of many failures. In fact, whole districts in the Union and abroad have suffered in years when improperly prepared or unprotected seed was used under unfavourable climatic and soil conditions. For large-scale production the seeds must be taken out of their perfectly protecting woody shells. On account of their high oil-content they go out of condition readily if kept under unfavourable conditions, or if the larger ones with their higher percentage of oil are planted in hot dry soils.

GROUNDNUTS.

In machine-shelling the frail testa, or seed coat, is easily chipped or otherwise damaged. The medium-sized and small seed is less subject to injury and loss of condition. The spores of black mould (*Rhizopus* spp.) and other seed and seedling-destroying fungi frequently lodge even in imperceptible nicks or cuts on the relatively soft seeds. The seed must therefore be treated against seed and soil-borne organisms. This is best done with dry seed-protectant powders. Wet dips such as formalin solutions are impracticable on the thin-coated groundnut seed.

Where the necessary storage, shelling and sizing facilities are available, the seed should be shelled as near planting time as possible. The different grades can then be planted through planters fitted with the appropriate attachments and plates, the largest size being reserved for soil that will remain moist at least until the plants are well established.



FIG. 6.—Stacked groundnut hay at Viljoenskroon, Orange Free State.

[Photo : Rhys Evans.]

Taking into consideration the conditions under which production is expanding, the following recommendations have to be made. Medium and small-sized seed should be used. As long as they are not chalky or mouldy, even the small, slightly shrivelled kernels will be found useful for planting purposes by the novice, who may be ill-equipped in the way of suitable planter gadgets. All seed should be thoroughly treated with a seed-protectant powder. The seed is costly as compared with the small amount of protectant that *may or may not* be required for its safety. The treating is best done in a revolving drum, at least a day or two before planting takes place. If seed and protectant must be mixed in a half-filled bag, the bag should be washed immediately after use, so that there is no danger of its being used for foodstuffs before the probably poisonous powder has been removed. Many proprietary brands of seed protectants are advertised in the agricultural press. It is not so much a matter which is the best, but how thoroughly they are applied. Directions for their use are generally given on their containers or by their suppliers.

Inoculation.

Groundnut roots are usually well covered with nitrogen nodules. Inoculation with bacterial cultures is therefore seldom necessary. It will be futile if a protectant is used at the same time. If it must be resorted to, however, a non-poisonous protectant should be used and the seed planted immediately.

Soil Preparation.

The land should be ploughed or otherwise prepared, as is generally done for maize in different areas, special care being taken to cultivate well before planting in order to bury trash, and to destroy weeds and germinating seeds. Undue haste to plant before a thorough pre-cleaning has been done means extra and more difficult weeding later.

Time and Method of Planting.

In most areas planting can take place from the middle of October to the middle of December. It should not be undertaken until good rains have occurred. In the warmer, frost-free, humid areas, planting may be delayed until January. If the summer rains cease early, harvesting can then take place under drier conditions.

The seed is planted with specially constructed planters or ordinary maize planters which must generally be fitted with extra attachments and thick plates with many large holes. For small evenly-sized seed, extra thick plates will not always be necessary. The many-holed plates revolve slowly, cause less breakage of seed and are particularly useful where fast draught is used. Oval holes are required for the planting of medium and large-sized Virginia Bunch seed. On edge-drop plates the corners of the seed apertures must be filed if they are inclined to cut the seed. If necessary, the tension of the springs under the knockers in the seed hoppers may be reduced, or the metal knockers may be replaced with ones cut from rubber, or even removed entirely, in which case small brushes will be necessary to regulate the flow of the seed.

Agricultural-implement agents should be consulted in connection with the different gadgets or alterations to be made to their specific makes of planters. Special plates for the planting of this seed are being made and advertised in the Union.

Spacing.

Spacing of the rows and seed is determined by local conditions. In areas of good rainfall or under irrigation, the rows may be 18 inches apart and the seed placed 6 inches apart in the rows.

As a general recommendation it is suggested that the rows be 32 inches apart and that the seeds be dropped 4 to 7 inches apart in the rows, at a depth of $1\frac{1}{2}$ to 3 inches, depending on the soil moisture conditions. Planting should not be shallow in the case of soils which are inclined to dry out readily.

Seed Required and Yields.

For the spacing suggested, about 50 to 60 lb. of medium-sized seed will be necessary per morgen, or, say, 200 lb. for about $3\frac{1}{2}$ morgen or 7 acres. Seed requirements will be determined very largely by the size of the seed and the spacing followed.

The general average yields under good, bad and indifferent conditions are from 1,000 to 1,200 lb. of unshelled nuts or from 650 to 800 lb. of shelled kernels per morgen. Where groundnuts are grown in rotations, fertilized, and carefully planted, and receive a fair amount of rain, yields of 2,000 to 2,500 lb. of unshelled nuts or 1,300 to 1,600 lb. of shelled kernels are obtained. Under very good conditions, especially under irrigation, yields of from 2,500 to 4,000 lb. of unshelled nuts per morgen have been the rule.

(A further article on this subject will appear in a subsequent issue of this journal, in which the necessary acknowledgments and references will be given.)

N.B.—The cultivation and harvesting of this crop were provisionally dealt with in the March, 1947, issue of *Farming in South Africa*. Reprints are also obtainable from the writer.)

Toxic-Smoke Generators for Termite Control.

W. G. H. Coaton, Division of Entomology, Pretoria.

THE great publicity given to D.D.T. as an insecticide during recent years has led many members of the public to use it in liquid, spray or dust form for eradicating colonies of the subterranean wood-destroying termite species which so frequently infest buildings in the Union. The results obtained have invariably been negative, even when the chemical was applied directly to the nests of the colonies as opposed to their feeding grounds. Benzene hexachloride, some formulations of which are marketed under the name "gammexane", is another recently developed insecticide which has been frequently but unsuccessfully used by the layman for eradicating termite colonies.

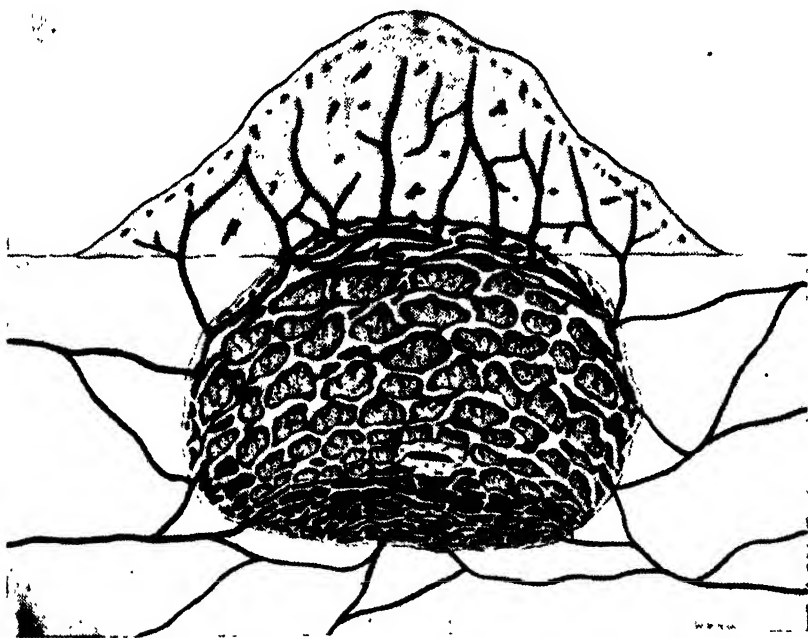


FIG. 1.—Semi-diagrammatic sketch of cross-section through mound and nest cavity of *Macrotermes natalensis*.

It will be shown, however, that both D.D.T. and B.H.C. are highly toxic and repellent to termites. Owing to the repellent properties of these substances, complete extermination of treated termite colonies can be obtained only by ensuring that the insecticides concerned are evenly distributed throughout the ramifications of the nest systems. The only known way of ensuring this even distribution is the introduction of the insecticides in smoke form and under pressure into the nest systems of the colonies to be treated. For termicidal purposes the smoke of B.H.C. will be shown to be more satisfactory than that of D.D.T. owing to—

- (a) its markedly superior speed of knock-down, even at lower concentrations; and
- (b) the fact that B.H.C. smoke is comprised of dry particles which do not condense in the applicator and are not as readily filtered out by nest structures and fungus gardens through which they must percolate as is the case with the moist smoke produced by D.D.T.

An applicator by means of which toxic smokes can successfully be introduced into the nest systems of the species chiefly responsible for timber destruction in buildings in the Union will be described here, and preliminary notes will also be given on the method of application to termite infestations out of doors and within buildings.

The Relative Toxicity to Termites of D.D.T. & B.H.C.

Laboratory tests to determine the relative toxicity to termites of D.D.T. and B.H.C. were carried out in Pretoria in 1946. The worker caste of the common mound-inhabiting termite species *Trinervitermes havilandi* Hgrn. was selected as the test insect, since it was plentifully available, easily collected and handled, and had been proved to survive well under laboratory conditions. The bottoms of a series of petri dishes 9 cm. in diameter were covered with filter paper circles which were moistened with water after being placed in position. Four prepared dishes were then dusted with each of the dusts tested, viz. 4 per cent. D.D.T. in verdile talc, 1 per cent. B.H.C. in china clay and 4 per cent. B.H.C. in china clay, the dosage in each case being the equivalent of 10 lb. of dust per half morgen. Four dishes were left untreated to serve as controls. Into each of these dishes 20 workers, which had previously been collected in vials in batches of the required number, were then put simultaneously. The dishes were then covered and kept at a constant temperature of 70—75° F. Five drops of water were added to the filter paper in each dish once in 24 hours for the duration of the experiment. Readings were taken at regular intervals to determine knock-down and mortality in each dish. The term "knock-down" included those insects, dead or alive, which were incapable of locomotion. "Mortality" reflected only those insects knocked down in which all movements of legs, antennae and mouth parts had ceased. As these treatments were repeated on three different occasions, the average percentages shown in Table 1 were each obtained from 12 dishes containing a grand total of 240 workers.

TABLE 1.

Exposure.	4% D.D.T.		4% B.H.C.		1% B.H.C.		Control.	
	Av. % knock-down.	Av. % Mortality.	Av. % knock-down.	Av. % Mortality.	Av. % knock-down.	Av. % Mortality.	Av. % knock-down.	Av. % Mortality.
40 mins. ..	0.0	0.0	98.1	0.0	68.3	0.0	0.0	0.0
1.5 hrs ...	0.0	0.0	100.0	0.0	98.3	0.0	0.0	0.0
27 hrs	75.7	64.1	100.0	99.5	100.0	95.8	0.0	0.0
44 hrs.	98.9	91.0	100.0	100.0	100.0	100.0	1.6	1.6
69 hrs.	100.0	100.0	—	—	—	—	2.0	2.0
165 hrs.	—	—	—	—	—	—	6.6	6.6

Relative Toxicity to Termites of D.D.T. & B.H.C. Dusts.

From Table 1 the following conclusions may be drawn—

- (1) In terms of the time required to yield 100 per cent. mortality, 4 per cent. and 1 per cent. B.H.C. are slightly more toxic to termites than 4 per cent. D.D.T., while there is little to choose between 4 per cent. and 1 per cent. B.H.C. in this respect.
- (2) In speed of knock-down, 4 per cent. B.H.C. is only slightly more satisfactory than 1 per cent. B.H.C., while both are infinitely superior to 4 per cent. D.D.T.. (The importance of this factor in termite control will be discussed later when the repellency of both substances is dealt with.)

Field Control Tests with D.D.T. & B.H.C. Dusts.

In view of the good results obtained in the laboratory toxicity tests, field control tests with 4 per cent. D.D.T. and B.H.C. dusts were undertaken against colonies of *Trinervitermes havilandi* Hgrn.

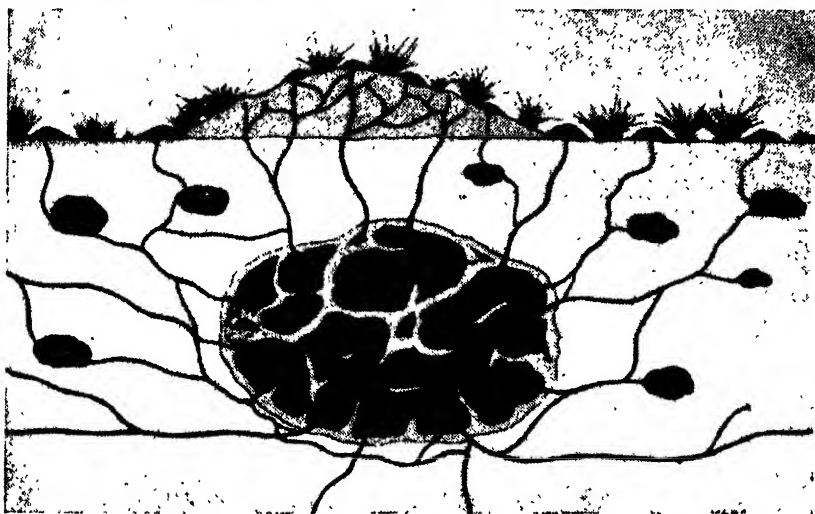


FIG. 2.—Semi-diagrammatic sketch of cross-section through mound and nest cavity of *Termes badius*.

and *Macrotermes natalensis* Hav. The former species feeds solely on grass, does not cultivate fungus gardens, and nests in a highly cellular mound, the bulk of which is located above the soil surface; the latter species destroys wood and any other material containing cellulose and nests in a large subterranean cavity broken up by clay shelving supporting masses of sponge-like fungus-gardens, the nest site being subtended on the surface by a hard clay mound pierced by internal passages.

The dusts were introduced into the nest systems by means of a hand dust gun or the more forceful cyanogas pump. Since the cubic content of each nest was an unknown variable at the time of treatment, no attempt was made to obtain comparable dust dosages in the various nests treated. Pumping in each case was continued until it was estimated that sufficient dust had been introduced to ensure coverage of the whole nest system.

The results of treatments, obtained by estimating mortalities when the treated nests were dug up from 2 to 5 days after treatment, are summarized below.

(1) *Trinervitermes havilandi*.

- (a) 4 per cent. *B.H.C.* treatments.—Sixteen colonies, inhabiting mounds with basal diameters ranging from 1 foot to 1 ft. 6 ins. and from 8 ins. to 1 foot high, were treated. When the mounds were dug up subsequently it was found that the dust had spread very poorly within them. The cells in a small portion of the mound contained heavy white deposits of dust, while the bulk of the nest system remained undusted in each case. Mortality in no case exceeded an estimated 5 per cent. of the total population. All living insects were crowded into and appeared to be living quite normally in the untreated portions of the mounds. No living insect voluntarily entered parts of the mounds where the slightest traces of the dust were visible.
- (b) 4 per cent. *D.D.T.* treatments.—Sixteen colonies inhabiting mounds of the same size range as those selected for *B.H.C.* treatments were dusted. The results were neither better nor worse than those obtained with *B.H.C.* The dust had spread very poorly within the mound, and the bulk of the nest system remained untreated in all cases. Areas reached by the dust were deserted of all living insects, the latter voluntarily isolating themselves in untreated areas. In no single case did mortality exceed an estimated 5 per cent. of the population.

(2) *Macrotermes natalensis*.

The dusts were applied through major passages uncovered in the mounds. Only one colony per dust was treated.

- (a) 4 per cent. *B.H.C.* treatment.—The mound was 1 ft. 6 ins. high with a basal diameter of 2 ft. During subsequent excavation, the top of the nest cavity was found to lie beneath the mound approximately at ground level. The width and depth of the cavity were 2 ft. 6 ins. and 2 ft. respectively. The passage through which the dust was introduced had a diameter of $\frac{1}{2}$ inch. The dust was applied by means of a cyanogas pump, a liberal treatment of 100 pump strokes being given. During excavation it was discovered that the dust had spread very poorly within the nest system. Extremely heavy white deposits were present in passages below and adjacent to the point of application, and also in the nest cavity for a small area around the point where the passage through which the dust was introduced, entered the nest. The bulk of the nest system remained untreated, and in such areas all living insects were concentrated. The treated portions were in the process of being sealed off from the untreated parts by means of fresh clay walls. Mortality did not exceed an estimated 5 to 10 per cent. of the population. The productive pair had survived and oviposition was proceeding normally.

TOXIC-SMOKE GENERATORS FOR TERMITE CONTROL.

- (b) 4 per cent. D.D.T. treatment.—The mound was 2 ft. high by 3 feet in basal diameter. During subsequent excavation, the roof of the nest cavity was found to lie beneath the mound, 6 ins. below general soil level. The cavity was 3 ft. wide and 2 ft. 6 inches deep. The passage in the mound through which the dust was introduced, was $\frac{3}{4}$ inch in diameter. The dust was applied liberally, 100 strokes with the cyanogas pump being delivered.

As with B.H.C. dust, on excavation it was found that the D.D.T. dust had spread very poorly within the nest system, the distribution being essentially the same as that described for B.H.C. The reproductive pair and approximately 95 per cent. of the population had survived, and the untreated portions of the nest system in which they were concentrated were in the process of being walled off with clay from the areas reached by the dust.

Quantities of the white deposits in treated areas were removed from each of the B.H.C. and D.D.T.-dusted nests, and in each case roughly distributed among four petri dishes. Twenty *M. natalensis* workers were then placed in each dish. Within an hour 100 per cent. of the insects in dishes containing B.H.C. deposits had been knocked down and 100 per cent. mortality ensued within 24 hours; in the case of the D.D.T. dust deposits, a knock-down of 100 per cent. and a mortality of 86.4 per cent. was obtained after 24 hours and a mortality of 100 per cent. ensued within 48 hours.

(3) Deductions.

From the field tests it is clear that, though B.H.C. and D.D.T. are toxic to termites, both are extremely repellent. With incomplete distribution of dusts containing these substances within the nest system, the repellency factor will ensure that no insect present on untreated areas enters treated areas where the toxic properties of the insecticides can take effect. Given 100 per cent. distribution of the insecticides within the nest system, however, all insects in the treated colony are forced to encounter treated areas and mortality will be complete. With both B.H.C. and D.D.T. for termite eradication, the degree of control obtained will thus be directly correlated with the degree to which the insecticides are distributed through the ramifications of the nest system.

Due no doubt to the speed with which comparatively coarse dust particles settle out in the labyrinthine system of chambers and passages comprising the nest of termites, and also in the spongy fungus gardens of those species cultivating them, it is quite clear that it can never be hoped to obtain the required coverage with B.H.C. and D.D.T. dusts to ensure complete eradication of treated colonies. For the same reasons application of these insecticides in liquid or liquid spray form would prove unsatisfactory.

At this stage of the investigations it became apparent that complete coverage and mortality could be hoped for only if the B.H.C. and D.D.T. were introduced into the nest systems under pressure in forms such as aerosols and smokes which are able to remain suspended in the air for comparatively long periods.

Preliminary Tests with B.H.C. & D.D.T. Smokes.

The formulation of the first smoke generators tested against termites was suggested and the generators were prepared by the Division of Chemical Services. One pound of the smoke-generating mixture was compressed in each of a series of floor polish tins 5 inches in diameter. Each generator could be ignited by touching a flaring match to two crossed strips of match-head composition laid over the surface of the mixture. The mixture consisted of 36 per cent. icing sugar and 12 per cent. sodium chlorate, allowing the incorporation of 52 per cent. of the toxic ingredient. In both D.D.T. and B.H.C. smoke generators, from 60 to 70 per cent. of the toxic ingredient was recoverable from the smoke. A generator became exhausted in just over 4 minutes after ignition and a sufficient volume of smoke was generated to fill satisfactorily 20,000 to 30,000 cubic feet of room space.

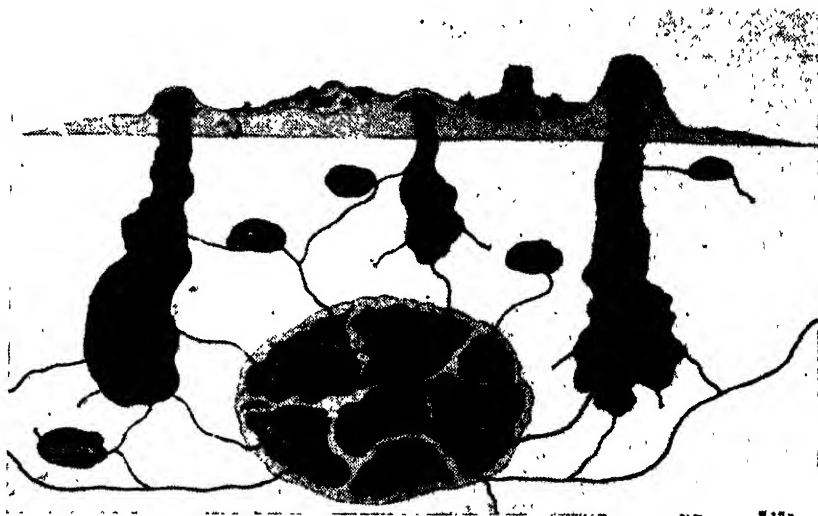


FIG. 3.—Semi-diagrammatic cross-section through mound and nest cavity of *Termes latericius*.

To convey the smoke into the opening of the subterranean termite passage selected for treatment it was necessary to devise a pressure-tight applicator in which the generator could be ignited and from which the smoke could be directed into the passage. It was hoped that, by burning the generator in the very confined space within the applicator, sufficient pressure would be generated to force the smoke cloud produced throughout the nest system.

An applicator was fashioned out of iron piping 6 inches in diameter and just high enough to contain one generator. To the bottom of this was brazed a metal base-plate, while the lid was held firmly against the machined upper rim by means of two strong steel spring clamps attached to the sides of the cylinder. The smoke was led off through a shaped metal funnel brazed over a slit 2 inches deep and embracing nearly half the circumference of the cylinder. The funnel was reduced at the tip to grip a metal pipe 1 inch in

TOXIC-SMOKE GENERATORS FOR TERMITE CONTROL.

diameter, threaded at its distal end. To this outlet pipe was screwed, by means of a connecting socket, a 3-foot length of $\frac{3}{4}$ -inch diameter flexible, heat-resistant metal tubing ending in a nozzle measuring $\frac{3}{4}$ by $\frac{1}{4}$ inch.

The exit nozzle was inserted into a suitable passage uncovered near the nest to be treated and sealed in position with stiff clay. The generator was then placed in the applicator and ignited, after which the lid was clamped down.

In the initial tests with the applicator, eight colonies of each of the wood-destroying fungus-grower species *Macrotermes natalensis* Hav., *Termes badius* Hav. and *Termes latericius* Hav. were treated,

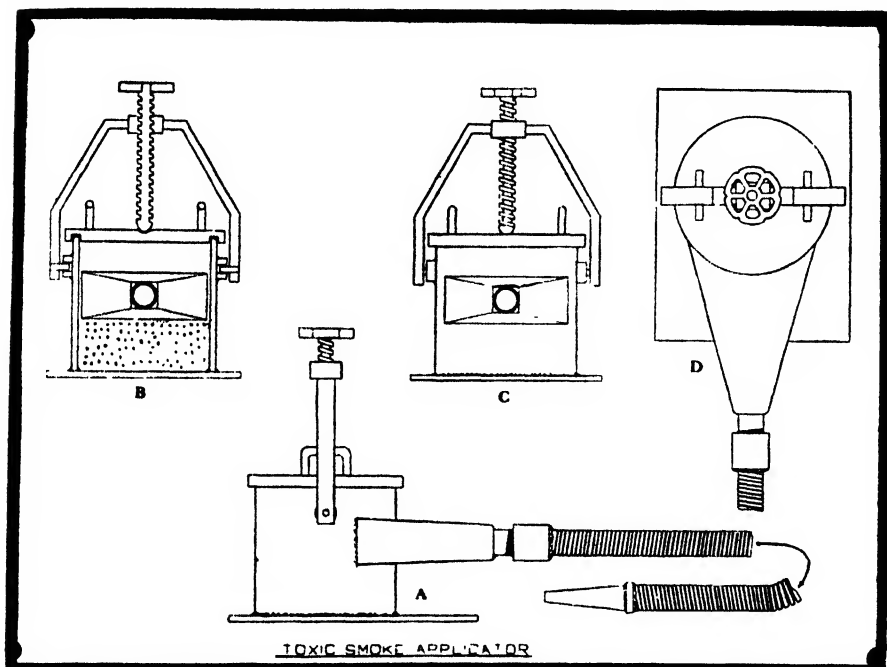


FIG. 4.—Toxic-smoke applicator.

A. Side elevation ; B. Section ; C. Front elevation ; D. Plan.

half of them with B.H.C. and half with D.D.T. smoke at a dosage of one generator per nest. Semi-diagrammatic sketches of cross sections through the mounds and nest cavities of these species are reproduced in Figs. 1 to 3 to clarify subsequent observations. With *T. latericius* colonies the smokes were introduced directly through the airshafts, and with the remaining two species through passages with diameters of $\frac{3}{4}$ inch or more uncovered over or in the vicinity of the nest sites.

In all cases the applicator satisfactorily directed the smoke generated into the subterranean nest system. A great deal of the D.D.T. smoke was, however, lost due to condensation in the cylinder and outlet tube of the applicator. Apart from the soiling of the apparatus and loss of toxic ingredient, this is a distinct disadvantage as the condensation decreases the pressure generated and the tarry liquid tends to block up the outlet tube. With B.H.C. smokes there

was practically no condensation in the applicator. It was subsequently ascertained that the D.D.T. smoke consisted of very fine liquid particles, while that of B.H.C. was formed by finely divided solid particles, thus explaining the presence or absence of condensation in the applicator.

Results of treatments were ascertained by digging up the treated nests 7 days later and estimating smoke penetration and mortality. Against all three species the B.H.C. smoke yielded mortalities and penetrations from 10 to 20 per cent. better than those obtained with D.D.T. smoke. This can no doubt be attributed to the condensation in the applicator of D.D.T. smoke, resulting in loss of insecticide and pressure, and to the greater ease with which a moist smoke is absorbed in the nest structures and fungus gardens through which it must percolate than would be the case with a dry smoke.

In the case of the four *M. natalensis* colonies treated with B.H.C. smoke, mortalities averaging approximately 50 per cent. of the total populations were obtained. The nest structures on the side from which the smoke entered were devoid of life and neglected, and contained only dead insects, but the smoke generator had in each case been exhausted when an average of 50 per cent. of the nest volume had been penetrated. It was thus clear that, even in the case of a dry smoke, the fungus gardens and nest structures through and around which the smoke must percolate, act as filters, thin out the smoke cloud and prevent adequate penetration.

With the more diffuse nests of *T. latericius* and *T. badius* the results obtained with B.H.C. smoke were even less satisfactory than was the case with *M. natalensis*. In the nests of these species the smoke must first of all fill and build up sufficient pressure in the central nest cavities before it is forced outwards to the supplementary fungus chambers situated in the surrounding soil. In no single case was it found that more than 50 per cent. of the volume of the main cavity had been covered by the smoke, with the result that practically all the supplementary chambers escaped treatment. Consequently the estimated mortalities did not average more than 25 per cent.

In all nests treated with B.H.C. or D.D.T. smoke, the insects in areas which escaped treatment, were alive and normal and had cut off by means of freshly constructed clay walls all access to the deserted, neglected treated portions of the nests. It was in fact possible to determine the limits of penetration of the smoke in every case by observing the location of these new clay dividing walls. The conclusion drawn as to the repellency to termites of both substances earlier in this article was thus amply confirmed.

Deductions.

(1) Owing to the high rate of condensation of D.D.T. smoke in the applicator and its absorption in the nest system, with consequent decrease in coverage of the nest and insect mortality, it was at this stage decided to discontinue tests with it and to concentrate in further tests only on the more promising B.H.C. smoke. The speedier rate of knock-down with B.H.C. as compared with that of D.D.T., even when the former was used at lower concentrations, strengthened this decision. Since both substances are highly repellent, speedy knock-down would serve to confine insects on treated areas where the toxic properties could take effect.

TOXIC-SMOKE GENERATORS FOR TERMITE CONTROL.

(2) To obtain more complete coverage of the nest system with B.H.C. it would be necessary to introduce the smoke into the nest under greater pressure. By cutting down on the time factor without decreasing the volume of smoke produced, there would be less time for the fungus gardens and nest structures, through and around which the smoke must percolate, to filter out the solid smoke particles.

(3) In the view of the toxicity and high rate of knock-down with B.H.C. even when used at low concentrations, it was concluded that the speed of generation of smoke could be accelerated by increasing the percentage of burning mixture in the generator at the expense of the B.H.C. content without necessarily decreasing the termiticidal value of the smoke produced.

Initial Tests with "Gammexane" Smoke-Generator No. 12.

At about this stage in the investigations supplies of "Gammexane" Smoke-generator No. 12 were made available to the writer for testing. The mixture in this generator consisted of approximately 70 per cent. burning ingredients to 30 per cent. B.H.C., which appeared to be about the right proportion to ensure the speedier smoke generation required. Approximately one pound of the mixture was supplied in the form of loose granules in a sealed container $3\frac{1}{4}$ inches

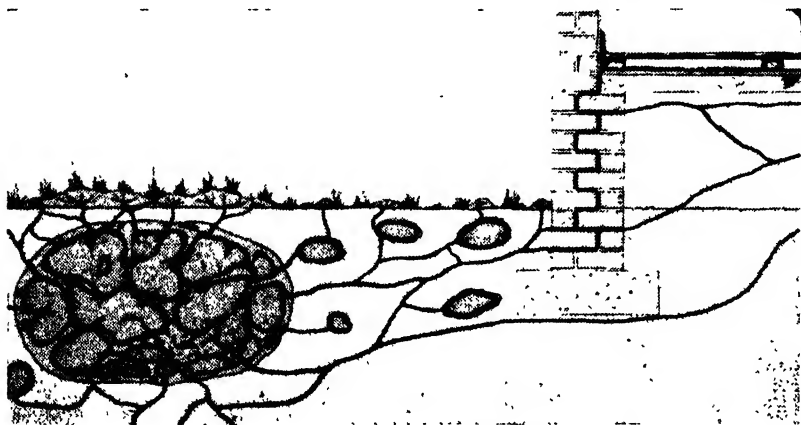


FIG. 5.—Infestation of building from *Termes badius* nest out-of-doors.

in diameter, complete with touchpaper to ignite it. The speed of generation could be increased still further by decanting and igniting the mixture in the cylinder of the applicator already evolved (diameter 6 inches cf. $3\frac{1}{4}$ inches of the container supplied, thus providing a burning surface 3.4 times greater). When ignited in the applicator, one pound of the granules liberated in 2.5 minutes, as compared with the previous 4 minutes, a cloud of smoke equal in volume to that of the generators already tested.

Four nests of each of the species *M. natalensis* and *T. badius* were treated at a dosage of 1 lb. of this mixture per nest, the granules being decanted into, and ignited in, the cylinder of the applicator. Results were obtained by digging up the nests 7 days after treatment.

Of the 4 *M. natalensis* colonies, 2 were completely exterminated, the smoke having penetrated throughout the nest systems. In the other 2 colonies, however, small portions of the nest were not reached by the smoke and in these, walled off from contact with the treated

areas, all the living insects were located. Mortalities were estimated at 85 per cent. and 95 per cent. in these two cases, thus yielding an average mortality for this species of 95 per cent.

Owing to the more diffused type of nest constructed by the species, the results of *T. badius* treatments were less satisfactory. In all cases small portions of the main nest cavities were untreated and contained live insects, while the bulk of the supplementary fungus chambers escaped treatment. Mortalities of 50, 50, 66.6 and 75 per cent. were estimated—an all-over average of 60.4 per cent.

Deductions.

(1) Though the smoke produced by 1 pound of mixture containing 70 per cent. burning ingredients and 30 per cent. B.H.C. was sufficiently toxic and yielded a greatly increased coverage of the nest system, 100 per cent. control even in cases of concentrated nests such as those constructed by *M. natalensis* could not be guaranteed. The increased speed of smoke generation was thus clearly not sufficient to overcome completely the smoke-filtering effect of the nest structures and fungus-gardens through and around which the smoke had to pass.

(2) The only solution which suggested itself was to increase the volume of smoke introduced into the nest system while maintaining the increased speed of generation.

Advanced Tests with "Gammexane" Smoke-Generator No. 12.

The contents of the smoke-generator No. 12 canisters were decanted into the cylinder of the applicator used thus far, and ignited. Since the diameter of the burning surface remained the same, i.e. 6 inches, it was expected that twice the volume of smoke produced by one generator would be released in 5 minutes, i.e. in double the time. In practice, however, it was discovered that the increased depth of the charge greatly accelerated the rate of burning, the full charge becoming exhausted in approximately 1.5 minutes, while about 95 per cent. of the smoke was given off in 20 to 25 seconds. In other words, with a double charge in the applicator, twice the volume of smoke was produced at a speed of generation more than three times greater than that obtained when a single charge was used. With this increased volume and speed of generation of the smoke there appeared to be little doubt that even the diffused nests of *T. badius* could be completely penetrated.

Unfortunately the applicator which had hitherto been used, proved incapable of withstanding the increased pressure within the cylinder. The internal pressure against the lid extended the spring clamp holding it down and a great deal of smoke, instead of being forced into the nest, escaped under the lid. After several failures, an improved model of the applicator capable of withstanding the increased pressure in the cylinder was designed. This is described below.

Sketches showing the side elevation, front elevation, plan and section of the applicator are given in Fig. 4.

The cylinder consists of a 6-inch length of iron piping 6 inches in diameter, to the bottom of which is brazed a $\frac{1}{2}$ -inch thick iron base-plate 9 inches wide by 12 inches long. The base-plate projects forwards under the exit funnel for $4\frac{1}{2}$ inches so as to maintain stability. On one side of the cylinder, $2\frac{1}{2}$ inches from and parallel to the bottom,

a slit 2 inches deep is cut out. The distance across the base of the arc of the slit is $5\frac{1}{2}$ inches, i.e. it embraces nearly half the circumference of the cylinder. To the outside of the cylinder a 5-inch long shaped metal funnel is brazed over the slit. The funnel narrows down to grip at the end a 1-inch diameter outlet pipe. The latter is threaded at its distal end; to it is screwed by means of a connecting socket a flexible, heat-resistant metal tube $\frac{3}{4}$ inch in diameter and approximately 3 feet long. The outlet tube is narrowed down at the end by means of a metal nozzle $\frac{3}{4}$ by $\frac{1}{4}$ inch wide at its opening.

The circular lid is slightly wider than the cylinder, being cut to shape from $\frac{1}{2}$ -inch thick iron. It is grooved to a depth of $\frac{1}{4}$ inch to hold with very little play the machined upper rim of the cylinder. At the base of the groove packing is wedged to prevent loss of smoke over the rim of the cylinder. Two finger hoops are fixed to the lid to facilitate its removal and replacement.

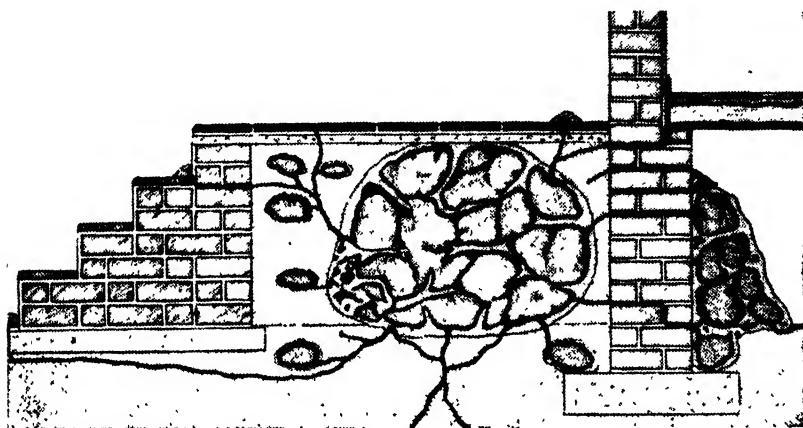


FIG. 6.—*Termes badius* nest in earth core of stoep.

The lid is held firmly in position by means of a screw clamp hinged into two nuts brazed on to the sides of the cylinder. The arms of the clamps are made of iron strips $\frac{7}{16}$ inch thick and $\frac{3}{4}$ inch wide, bent into the shape illustrated. The arms of the clamp must be sufficiently high to clear the lid of the cylinder when the screw is fully retracted. The brass screw is $\frac{7}{8}$ inch thick with a double-start thread, with three threads to the inch. It works through a brass cube set in the middle of and brazed to the arms of the clamp. The central cube is $1\frac{1}{2}$ inches long by $1\frac{1}{8}$ inches wide by $\frac{3}{4}$ inch deep. Where the screw of the clamp presses against the lid, a shallow depression is provided in the surface of the lid to hold the tip of the screw.

The contents of two generators are decanted into the cylinder of the applicator, lumps are crushed and the surface of the mixture levelled off. The surface of the crystals will be slightly lower than the bottom of the outlet slit of the cylinder. It is advisable to rest the cylinder of the applicator on a box or drum to elevate it above the soil surface and to allow the outlet tube to run downwards in

a straight line or even a curve to the opening of the passage selected for treatment. Any molten material blown into the tube will thus flow and be blown out of the nozzle, to be absorbed in the soil. U-bends in the outlet tube must at all costs be avoided. In them molten material has been found to collect, thus blocking the free flow of the smoke produced. The passage selected for treatment must have a minimum diameter of $\frac{3}{4}$ inch, and must be clear of any loose soil likely to cause a blockage. The nozzle of the outlet tube is inserted into the passage selected for treatment and all openings to the exterior around it are sealed up with stiff clay. The square of slow-burning touchpaper is now inserted to half its depth at an angle in the burning mixture, one corner is ignited, and the lid is clamped down on the cylinder. At least 25 seconds will elapse before the mixture ignites, thus allowing ample time for the lid-clamping process. The whole treatment, from ignition of the touchpaper to exhaustion of the charge, should take approximately 2 minutes.

Since two pounds of the mixture produce a volume of smoke sufficient to fill 40,000 to 60,000 cubic feet of room space, it will be realized that the pressure generated in a cylinder with a cubic content of only 169 inches, and the outward thrust of the smoke from the nozzle, must be great when 95 per cent. of the volume of smoke is generated in 20 to 25 seconds. If the mixture is burned under too great a pressure there exists the danger that it may become explosive. Hence some safety valve must be provided. In the applicator this is provided by the coarse thread of the screw in the clamp. When this is very lightly oiled and some blockage occurs in the outlet tube or the passage through which the smoke is being introduced, the screw turns slightly owing to the increased pressure against the lid and part of the smoke escapes under the lid, reducing the pressure within. This has actually happened in practice on three separate occasions. Provided there is no blockage preventing the normal flow of smoke into the termite nest, the clamp is sufficiently firm to prevent loss of smoke from beneath the lid.

The double charge of "gammexane" smoke-generating mixture in the applicator described above has been tested in the field against twelve colonies each of the species *T. badius* and *M. natalensis* with 100 per cent. control and penetration in every case. In the twelve *T. badius* colonies treated, in every case even the most remote supplementary fungus chambers were reached by the smoke.

Since the use of the applicator demands the introduction of the smoke through passages of a sufficient width to allow the easy flow of the smoke generated, this method of eradication cannot be advised for use against species belonging to the families Kalotermitidae, Hodotermitidae, Rhinotermitidae and the genera *Microtermes*, *Allodotermites*, *Ancistrotermes*, *Microcerotermes* and *Trinervitermes* of the family Termitidae. Only species belonging to the genera *Macrotermes* and *Termes* (family Termitidae) in South Africa construct subterranean passages of the required dimensions.

The Use of the Applicator in Termite-Infested Buildings.

Infestation of buildings by subterranean wood-destroying termites is, without doubt, one of the most pernicious domestic insect problems with which most South African property owners have to cope. In Pretoria, for example, an average of 1,000 buildings become

termite-infested each year, costing the property owners for control operations and timber replacements an estimated £15,000 per annum. Conditions on the Witwatersrand are equally serious, recent surveys having shown that 53·5 per cent. of existing buildings either are, or have been, termite-infested on one or more occasions subsequent to their erection.

In most parts of the world where termites are of economic importance, the greatest proportion of the timber destruction caused in buildings is brought about by species belonging to the family Rhinotermitidae which do not construct subterranean passages of a sufficient width to permit the use of the applicator described above. In South Africa, however, the Rhinotermitidae do not frequently infest buildings except in the case of the species indigenous to the sparsely settled desert areas of Namaqualand. In the Union the chief destroyers of timber in buildings are eight fungus-grower species belonging to the genera *Macrotermes*, *Termes*, *Microtermes* and *Allodontermes* of the family Termitidae. A survey made by the writer in Pretoria revealed that in 520 infested buildings, the termite species involved belonged to the genera *Macrotermes* and *Termes* in 98·9 per cent. of the cases, and to *Microtermes* and *Allodontermes* in only 0·8 per cent. In other words, the species involved construct



FIG. 7.—*Termes badius* nest occupying the air space between suspended floor and soil.

subterranean passages of a sufficient width to permit the use of the applicator described above in approximately 99 per cent. of infested buildings. The data for Pretoria are more or less representative of the greater part of the vast area of the Union in which wood-destroying termites are a serious problem.

The Pretoria survey revealed in addition that the nests from which the 520 buildings were infested were located as follows:—

- (1) nests situated out of doors, 3·9 per cent. (Fig. 5);
- (2) nests situated below floors and stoeps in the buildings, 96·1 per cent.

In most cases of infestation, therefore, the nest will be found indoors rather than extra-murally. Of the nests found within buildings, 58·6 per cent. were in the earth cores below the slabs of stoeps, floors and hearths (Fig. 6), 22·0 per cent. occupied the air-space between suspended floors and the soil below (Fig. 7), 19·2 per cent. were situated in the soil below suspended floors (Fig. 8), and 0·2 per cent. were placed in raw-brick walls above floor level.

Various indications can be used to determine the approximate location of the nest—

- (a) when winged reproductive individuals swarm from their parental nest to establish new colonies, they usually do so by means of specially constructed subterranean tunnels leading by the shortest distance from the nest to the soil surface outside the building. If the flight holes are located, the nest will most probably be situated below the floors or solid slab surfaces nearest to them.
- (b) During the summer rainy seasons, *T. badius* (the culprit in 87.2 per cent. of the Pretoria cases) deposits old fungus garden material on the soil surface near the nest site. Given dull, moist weather these will within a day or two sprout masses of dainty white mushrooms visible on the surface for a few days. If these fungal growths are discovered, the nest will be located nearby.
- (c) When the nest system is being enlarged, the soil excavated is dumped on the surface over or near the nest site in the form of cemented clay moundlets.
- (d) If the nest is situated below suspended floors, mound and/or nest structures are easily seen when a sub-floor inspection is made.
- (e) Surface tapping of suspended floors will often betray solid spots where mound or nest structures have come into contact with the timber of such floors. The timber at these points will always be abnormally moist.
- (f) Surface tapping by crowbar on solid slab surfaces will often reveal the presence of the hollow in the core created by the nest cavities.

Nests located below suspended floors are easily treated with the applicator. The removal of mounds or moundlets below the floors will provide passages of a sufficient diameter to permit treatment, or the smoke can be introduced into the nest itself by means of a hole driven through the outer clay walls should it be located directly in the air space. Should the mound or nest touching flooring timbers be located by tapping, a hole drilled through the flooring timbers will usually make treatment possible from floor level.

Nests located in the cores below the slabs of stoeps, floors and hearths are more difficult to deal with as their exact location can as a rule not be determined. Should moundlets above cracks in the slab be located on the surface, the slab at such a spot can be broken to uncover a suitable passage for treatment in the earth core below. If the nest cavity can be determined by sounding on the surface, a hole can be drilled through the slab at such a spot and the smoke introduced directly into the nest below. If the nest site cannot be reached in any of these ways, trenching along exterior foundations in spots where moundlets, flight holes or fungal growths on the surface have been observed in the summer months, will uncover suitable passages for treatment. Such passages should be followed up, and those entering the building below the foundations should be selected for treatment. Those entering *via* the mortar between bricks in foundation walls should not be used as they are usually constricted within the walls, thus preventing the free flow of the smoke generated. In such cases loss of smoke under the lid of the applicator may be expected. If passages entering the building *via* the mortar between brick courses must be used, it is advisable

to remove a few bricks in order to uncover a sufficiently wide passage in the earth core beyond the foundation wall.

In many cases it will be found that, though the main nest cavity is successfully treated, extensions of the nest system placed below the floors of adjoining rooms may escape, owing to the connecting passages through the mortar between bricks of intervening foundation walls being too narrow to permit the flow of the smoke through them. The sub-floor areas of all rooms adjacent to the one containing the main nest cavity must be suspect, and retreatment of extensions of the nest system in them may be necessary.

By working on the lines given above, it is in most cases in the Union possible to eradicate subterranean wood-destroying termite colonies in buildings by means of B.H.C. smoke introduced into the nest systems with the applicator described above. The method has

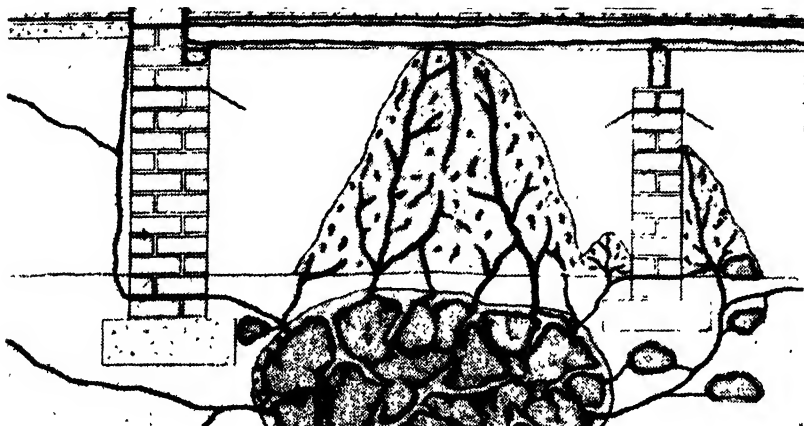


FIG. 8.—*Termes badius* nest in soil below suspended floor, with the mound structure touching the timber.

been tested by the writer in seven infested buildings in Pretoria, with 100 per cent. control of the colonies in six cases. In one case retreatment on a second occasion was required before complete eradication of nest extensions of the colony was obtained.

Conclusion.

Though this work on the use of toxic smoke for the eradication of colonies of subterranean wood-destroying termites is as yet in the advanced experimental stage, the results of tests made by the writer have been so uniformly successful as to permit publication of this preliminary report. Whether the method will become widely adopted in the Union will depend on various factors, but mainly—

- (1) Whether the method is sufficiently flexible to permit its adaptation to all the greatly varying types and circumstances of infestation to be dealt with by the non-specialist operator;
- (2) whether applicators will be manufactured and be available at a reasonably low economic level; the need for the present elaborate canisters does not arise in termite-eradicating operations as the crystals are ignited in the applicator cylinder—supplying the mixture and touch papers in bulk would assist in reducing costs;
- (3) whether applicators will be manufactured and available to commercial operators and the public.

[Continued on page 745.]

The Control of Fruit Flies.

Dr. Bernard Smit, Principal Entomologist, Division
of Entomology.

OF all the insect pests of fruit in South Africa, the fruit flies undoubtedly constitute the worst pest because they attack such a great variety of fruits and because in most seasons the proportion of fruits attacked is so very high. It has been estimated that in home gardens about 80 per cent. of the peaches are destroyed by the flies each year and in many gardens, where no control measures are applied, not a single peach is found that is fit to eat. There are a large number of fruit flies which develop in many kinds of wild fruits and flowers and some that infest the fruits of cucurbit plants such as marrows, pumpkins, melons and squashes. Those that infest our cultivated stone fruits, however, belong to only two species. These are the Mediterranean fruit fly, *Ceratitis capitata*, Wied., and the Natal fruit fly, *Pterandrus rosa* Ksh. The former is an introduced species from the Far East, while the latter is indigenous. Formerly, the Natal fruit fly was found only in Natal, hence the name, but now it has spread south along the coast and into the western Cape Province where it is almost as serious a pest as the Mediterranean fly.

We find that these insects pass the winter as adult flies and although many are undoubtedly killed by frost and drought, there are always enough left to start the new infestation in spring. The pest is worst where a large variety of fruits is grown and where fruits ripen irregularly over a long period. Such conditions often occur in our country towns, where each householder has a small orchard comprising many kinds of fruit trees. In spring, the flies begin breeding in apricots and continue throughout the summer to finish up in ripe apples and pears. Nectarines are particularly susceptible, but so are late peaches. Late in the citrus season the flies usually cause much damage in citrus groves by attacking navel oranges, because, although the flies do not usually breed in citrus fruits, the fruits that are "stung" quickly break down and have to be very carefully "culled" in the packing shed. It has been found that the flies migrate in large numbers into citrus groves when the weather is hot and dry, presumably in order to find shelter and moisture, and it is then that they may attack the fruit with their ovipositors. Under such circumstances the flies can be killed very effectively with poison bait.

The Mediterranean fruit fly breeds mostly in cultivated fruits, although we have records of it breeding in some wild fruits and in prickly pears. In the eastern Cape Province it breeds freely in the fruit of milkwood trees (*Sideroxylon inerme*) and in monkey apples (*Royena spp.*). The Natal fruit fly has a wider host range and breeds more readily in wild fruits. The adult flies of both species occur in large numbers in wild bush at certain times of the year and from there they fly considerable distances into orchards.

In Natal the bug tree, *Solanum auriculatum*, plays an important part in sheltering, and as a host of, the Natal fruit fly, and the spread of this plant has aided the spread of this species.

It should be remembered that there are many species of fruit flies that breed in wild fruits, but fortunately these have not so far attacked cultivated fruits.

One of the most important things to remember in connection with the control of fruit flies is that the flies must have a regular

THE CONTROL OF FRUIT FLIES.

supply of food and water in order to live. Their food consists of sweet liquids such as the honey dew voided by aphids and scale insects, the sap of plants, the juice of fruits and, for drink, the drops of dew on trees. If they do not get this moisture, the flies soon die.

After feeding and mating, the female flies are ready to lay eggs in about three weeks, and their eggs are laid just under the skin of ripening fruit. This they do with their sharp ovipositors which pierce the skin of the fruit and deposit several tiny eggs at the base of the puncture. This is often called "stinging" the fruit and, in fact, that is just what it is, although in the case of the fruit fly it is the eggs that are deposited, while in the case of the bee it is only a minute drop of poison. The effect of the fly "sting" on the fruit is more serious, however, than a bee's sting on the hand, because in the case of the fruit there is no recovery. The eggs hatch in about two days and from them come small white maggots which work their way down to the pit and cause the fruit to rot and drop off the trees. The maggots take about two weeks to become full-grown and then leave the fruit to pupate. They are active creatures and feed on the tissues of the fruit which turns soft and brown. By the time the maggots are mature, the fruit has usually fallen to the ground and they then leave it and burrow a few inches below the surface. There the maggots transform into puparia, which look like little brown capsules in the soil. Inside, the whole structure of the maggot is rebuilt into that of a fly and after another two weeks the new fruit fly emerges. At first the fly is soft and of a light grey colour, with its wings all folded up, but it can nevertheless push its way through several feet of loose soil. After a few hours it colours up and expands its wings, and is then able to fly. Both these species of fruit fly are beautifully coloured with "pictured" wings and shining iridescent eyes and yellowish-brown bodies. They are a little smaller than houseflies. Their most striking characteristic is the way in which they hold up their wings while sitting on the fruit as if ready to take off in flight at any moment. After emerging it takes the flies about three weeks to mature and be ready to lay eggs and during this period we have a good opportunity of poisoning them. If not poisoned, they can live for five or six months and lay eggs at intervals throughout that period.

Disposal of Infested Fruit.

From what has been said about the development of the maggots in the fruit, it is obvious that all infested fruit should be picked up and disposed of before the maggots are able to finish feeding and escape into the soil, for otherwise the following generation of flies will emerge. All infested fruit on the trees should be picked and all fruit on the ground should be raked up. Burying this fruit is dangerous because the flies can still emerge from considerable depths. The best way to dispose of it is to throw it into an old oil drum and cover it with water and a little paraffin. This will drown all the maggots, and, if there are any puparia, the paraffin will kill the flies as they emerge. All infested fruit should be disposed of once a week.

Poison Bait.

The second control measure, and one that has given excellent results, is baiting with a sweet liquid poison. If this baiting is done regularly, there is no reason why a sound crop of peaches or other

fruit should not be obtained. As the flies are "gross drinkers" (according to Ripley), this fact is taken advantage of by lightly spot-spraying the trees with the following solution:—

Water	4 gallons.
White sugar	2 lb.
Sodium fluosilicate ...	1 ounce.

Formerly arsenate of lead was used, but the sodium fluosilicate is soluble in water and with the sugar makes a clear solution which does not need stirring as much as the lead arsenate bait did. Moreover, sodium fluosilicate is sixteen times as toxic to fruit flies as lead arsenate. The only disadvantage of this new bait is that white sugar must be used, but this is usually easily procurable in South Africa. Sodium fluosilicate is a white powder which is now manufactured in this country and costs about 9d. per pound.

Spray the trees on at least two sides, using an ordinary garden syringe or locust pump. The Abol type of syringe is suitable, but some years ago the author developed a combination outfit which enabled one man to spray an orchard quickly and easily by carrying the solution in a knapsack container on his back. The container was connected to the syringe with a rubber tube, fastened to a valve on the side of the syringe, which allowed the liquid to enter without having to dip the syringe in a bucket each time it was filled. An old motor tube slung over the shoulder like a bandolier makes a good container for the solution and can also be connected to the syringe in the same way. Use a coarse spray giving fairly large drops, and as far as possible spray the foliage rather than the fruit. The object in spraying is to have the drops of poison hanging like dew drops so that the flies will suck them up when they come to the trees to feed. At the rate of about half a pint of spray per tree, an enormous leaf surface can be covered, so that the chances of the fly finding the bait are very great. The flies congregate in any leafy tree for shelter and in winter often migrate to evergreens like citrus trees. Such trees, hedges, wild bushes or any other foliage near the orchard should therefore be sprayed, as well as the fruit trees themselves.

When to Spray.

It is very important to do the spraying at the correct time and to do it regularly and persistently. If indicator bait traps are used in the orchard, a fair indication of the fly population can be obtained, and of course the baiting is most effective when the flies are most abundant. It is no use spraying when there are no flies to poison. Use one-pint fruit jars and hang them with wire loops in the orchard, one to every 20 to 30 trees. Various baits can be used, but Clensel is probably the most convenient for the Mediterranean fruit fly and pollard bait is better for the Natal fruit fly. The former is diluted at the rate of 30 parts of water to 1 of Clensel and about half a pint of this is put into each jar. The jars should be examined regularly. It will be found that the flies are most abundant after hot, dry weather when no dew has fallen during the previous night. Then is the best time to spray because the flies are also very thirsty at such times. A few sprayings should be given in winter on evergreen trees to catch the flies which are active on warm days at that time of the year and a few in early spring to catch the flies that have survived the winter.

[Continued on page 746.]

The Horse on the Farm.

VIII (b).—The Draught Horse.

Dr. P. J. v. d. H. Schreuder and F. B. Wright, Senior Professional Officers (Horses.)

IN previous chapters full attention has been given to all the salient features of the horse, and since practically all of what has been said, also applies to the draught horse, it only remains to stress the more important differences of types and breeds.

In the ideal draught horse one must continually stress weight, size, power and substance, without, of course, ever losing sight of quality as it affects wearing and working ability.

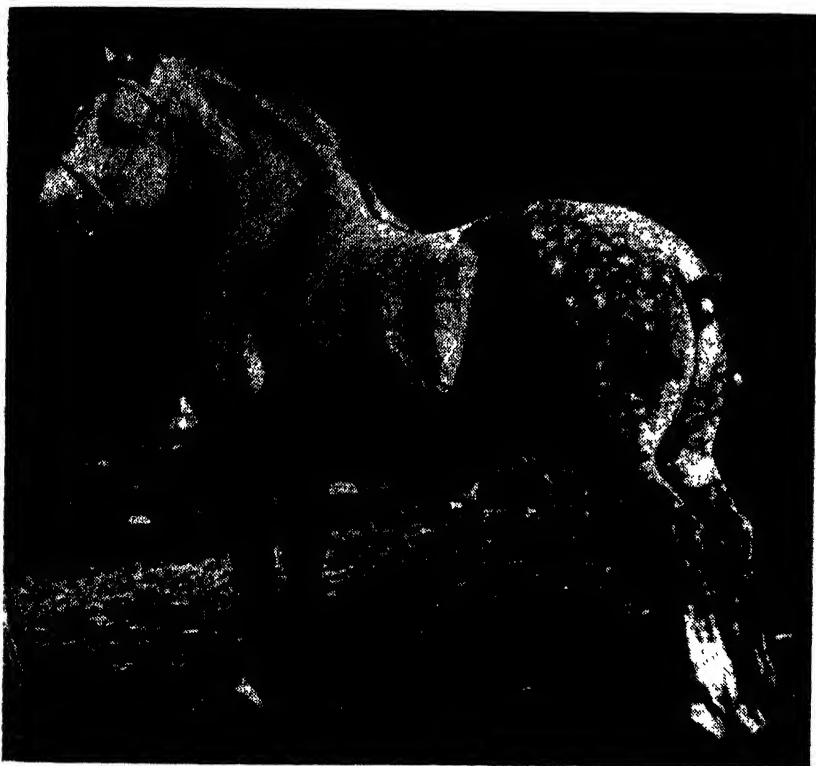


FIG. 1.—An International Grand Champion Percheron stallion.

The body of the draught horse is comparatively longer than in the light type, since the shoulders are more upright to meet the collar. The centre of gravity is lower for greater pulling power, the good draught horse being low-set, sturdy, broad-chested, powerfully muscled and thickly fleshed for substance and weight.

The mature, well-conditioned draught horse weighs from 1,600 to 2,000 lb. and stands from 15.2 to 17 hands. He should be well-balanced with a broad, deep, blocky but symmetrical conformation when viewed from the side, front and rear. Squareness of body-form from all angles, with massive size, indicates the necessary weight through which power is secured. At a short distance one should be entirely satisfied that no part is unduly over- or under-developed.

With a good, powerful conformation must be combined good wearing qualities—quality of bone, style, breediness and action, and animated intelligent temperament.

The wearing qualities are best indicated by the legs and feet. Viewed from the side, rear and front, the legs should be placed straight so that the body weight is equally distributed on all four limbs. The muscled parts—forearm and gaskin—should be heavily muscled and the joints clean, hard and neatly jointed. The cannon bones should be short, flat and lean, with the tendons showing up clearly. Shortness, flatness and quality of cannon bones are important, since they indicate wear-resisting qualities. A long cannon is often tied-in at the knee and is found in long-legged flat-ribbed horses. The fetlock joining cannon to pastern should be wide, correctly directed, strong and thick, so as to provide ample attachment for tendons and ligaments passing to pastern and foot. The pastern should be of moderate length and carried at an angle of 45° . If too short, it does not relieve or resist the concussion, and impedes the gait, which will be stilted. Longer and sloping pasterns save the legs from the injurious effects of concussion. Length of pastern

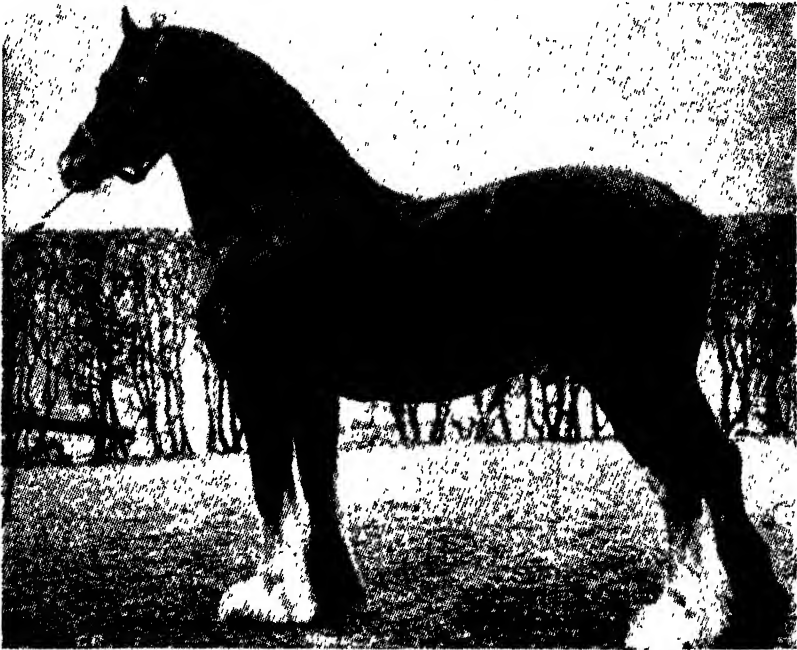


FIG. 2.—A Champion Clydesdale stallion of 1915–1927.

is a matter of opinion since much depends on the kind of work the horse has to perform and the type of road on which it must work. Hard work and hard roads demand a longer pastern. A pastern of medium length with a good slope to the ground is generally favoured by breeders and users of draught horses.

The Draught Breeds.

There are five recognized breeds of draught horses. Two were developed on the European continent, namely the Percheron and the Belgian which are characterized by their clean limbs and compact conformation, while three were developed in Great Britain,

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namely the Shire, Clydesdale and Suffolk. The first two are noted for their massiveness and "feathers", i.e. long hair on the back of cannons and pasterns, and the Suffolk for its short clean legs and deep body. These breeds vary in distinctive breed characteristics but in the essential draught attributes—weight, size and power—they have much in common.

The type of draught-horse sire that is favoured in the world's leading horse-breeding and horse-using countries is a comparatively short-legged, deep-bodied, short-backed, up-headed, heavy-muscled, big-boned, hard-hooved and compact animal.



FIG. 3.—A Champion Shire filly.

The measurements taken with a steel tape of two international grand champion Percheron stallions of recent years are not only very illuminating in indicating the points of a good sire, but also help one to appreciate the qualities of different sires, especially since one of these sires was declared "an ideal draught sire" (A), and the other a "type study champion" (B)

	A.	B.
Height over the withers.....	16 hands 2 inches	16 hands 2½ inches.
Height over the hips.....	16 hands 3½ inches	16 hands 2½ inches.
Length of front leg.....	2 feet 9½ inches	2 feet 9½ inches.
Heart girth.....	7 feet 6½ inches	7 feet 7 inches.
Flank girth.....	7 feet 7½ inches	7 feet 11½ inches.
Cannon bone (front).....	10½ inches	10½ inches.
Length of body.....	6 feet 2½ inches	6 feet ½ inch.
Weight.....	2,100 lb.	2,150 lb.

The following short descriptions are based on a perusal of the literature of the respective breed societies and give the barest outline of the great volume of information available on each breed.

The Clydesdale.

It is very noteworthy how much the fertile lands and ancient breeds of stock of the lowlands of Europe, generally spoken of as Flanders, contributed to the world-famous breeds of Great Britain.

Both the Clydesdale and its compeer the Shire owe much of their massiveness and general utility qualities to the war horses of Flanders, generally termed "Flemish horses".

The system of district hiring of Clydesdale stallions was an early feature of Scottish agriculture and did more than anything else to disseminate the blood of good sires and to establish the Clydesdale type of horse. Towards the middle of the 19th century the breed enjoyed a reputation far beyond its formative homeland. In varying form this system is used in various countries to improve their livestock.

The outstanding feature of the breed is the combination of weight, size and activity, with exceptional wearing qualities in respect of legs and feet—the main characteristics aimed since the early formative years. During the past seventy years, however, there have been variations in the degree of emphasis placed upon the various points mentioned, but amidst all these variations one cardinal principle has been kept in view—the enduring qualities of the legs and feet.



FIG. 4.—The famed Hackney "Evanthius" (\pm 1900).

The good Clydesdale, and for that matter the good draught horse, must in addition to true draught features—size, weight and massiveness—possess action, i.e. clean lifting of the feet. The inside of every shoe must be seen by a man standing behind the horse, as it moves away from him. Action also means "close" movement; the forelegs must be planted well under the shoulders, and not on the outside like the legs of a bulldog. The legs must be plumb and, as it were, hang straight from the shoulder to the fetlock joint. There must be no openness at the knees, nor any inclination towards knock-knees or "calf knees". In like manner the hind legs must be planted closely together, with the points of the hocks turned

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inwards rather than outwards; the thighs must come well down to the hocks, and the shanks from the hock joint to the fetlock must be plumb and straight. "Sickle" hocks are a very bad fault and lead to loss of leverage.

The feet must be open and sound like a mason's mallet. The hoof heads must be wide and springy—without any hardness that may lead to sidebone or ringbone. Further essential features are an open forehead with broadness between the eyes; a flat profile (neither Roman-nosed nor "dished"); a wide muzzle and large nostrils; bright, clear, intelligent eyes; big ears; a well-arched, long neck springing out of an oblique shoulder with high withers; a short back with ribs well sprung from the backbone like the hoops of a barrel; and long quarters with thighs packed with muscle and sinew. The hocks should be broad, clean and sharply developed; and the knees big and broad from the front.

The general appearance should be one of massiveness but not grossness, and give the impression of quality and weight combined with easy activity and action.

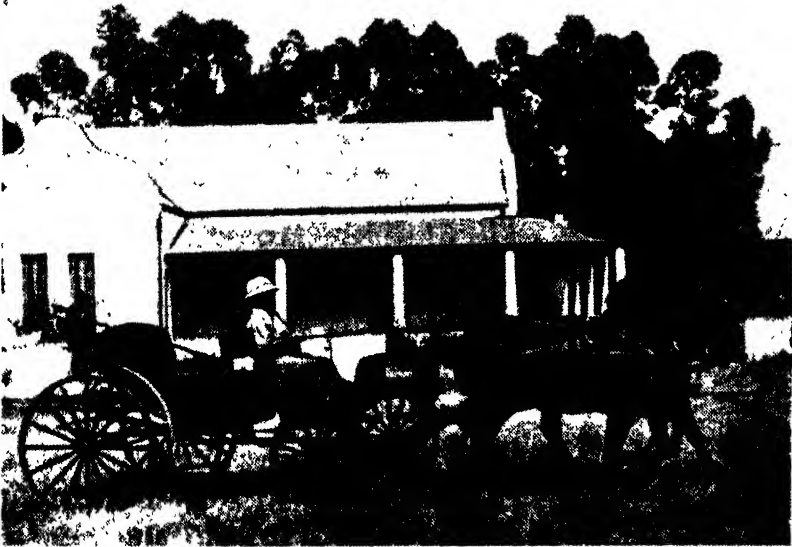


FIG. 5.—A spanking team of Hackneys (Robertson).

The ideal colour for the breed is bay or brown, with a more or less well-defined white mark (blaze, star or snip) on the face, dark coloured forelegs and white hind shanks. The only other colour is black, which is quite rare.

The weight of leading sires who lived to over twenty years, varies from 1,900 to 2,300 lb. with heights varying from 16.2 to 17.2 hands. (For fuller details consult brochures of "The Clydesdale Horse Society of Great Britain and Ireland" 93, Hope Street, Glasgow C2, Scotland; or write to the Clydesdale Horse Breeders' Society of South Africa, P.O. Box 281, Bloemfontein, O.F.S.)

The Shire.

The Shire horse of to-day, by careful and judicious selection, is a blend of the "big horses and the wide heavy horses of Lincolnshire and the Fens". Their ancestry is rooted in the war horses of

the tournament ground and the tented field of the 17th and 18th centuries.

In their early search for an English draught horse, British horsemen found a horse of great size and power, enormous muscle, big top, deep middle, powerful loins, but with round bone, coarse feather and feet not sufficiently wide. Action was a minor consideration at that period. These critical pioneers observed that amongst the horses of this type were specimens of outstanding merit that satisfied their ideals. They realized that these good horses were to be found *within the existing breed* and could thus be improved into an established type or breed.

An active and commanding yet docile appearance along with trueness to type, size, soundness, power, constitution, courage, good bone and solid feet are essential features in a Shire stallion.



FIG. 6.—A sample of "fine harness". Also winners under the saddle in the U.S.A.

The strength of the Shire, combined with weight and massiveness, was a feature of the formative type of the 19th century when two geldings usually shifted a net load of five tons. To-day a pair of Shire geldings is expected to move a load of double that weight.

The predominating colour of the breed is bay, brown and also black and grey. A blaze and two or more white socks or stockings are very usual markings in the breed. Outstanding stallions measure up to 84 inches round the heart girth, and 10½ to 12 inches below the knee.

(For further details and standard points, see brochures of the Shire Horse Society, 12, Hanover Square, London W1. England.)

The Percheron.

The ancestral home of this breed is the small province of La Perche—a region of green hills and verdant vales, populated by a patient, persistent, kindly, frugal, shrewd and home-loving people firmly rooted in the soil. Their horses are a part of their inheritance, and are particularly accustomed to the affectionate attention of the entire household. The tractability and docility of the Percheron grew out of this intimate human companionship as an inborn trait. Stallions are always worked, most often singly, but also in

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As in the case of other draught breeds, the formative type of the Percheron was based on the heavy war horses of Flanders, but early in the history of the Perche, oriental blood was introduced through the thousands of desert-bred oriental horses captured and brought home by the Crusaders. Even as recently as 1830 a few oriental sires were still used as improvement sires.

The influence of the oriental blood is readily recognized in the neat and animated head, intelligence, temperament and docility. It is this blending of blood of light and heavy types that established the affinity of relationship and assures the transference of draught and other utility qualities to the progeny of different types of light mares mated to Percheron stallions. Throughout the formative years of the breed, strength, stamina, quality and enduring wearing qualities of the feet and limbs were strongly stressed. The coaching traffic over bad roads and long distances called for superior qualities. In the moulding of the breed into a heavy type, the famed qualities of earlier types were added to weight and size, so necessary in the heavy draught horse.

The present-day favoured type is a compact, well-balanced horse, up-headed, well-muscled and clean-limbed, with quality in bone and good substance in body, standing 16 to 17 hands high and weighing up to 2,200 lb.

The National Conference of Percheron Judges and Breeders held in 1938, 1939 and 1940 and sponsored by the Percheron Horse Association of America, has fixed the weights for stallions at 1,900 to 2,100 lb. with 15·2 to 16·2 hands, and of mares at 1,750 to 1,900 lb with 15·2 to 16 hands. Weight and height, well-proportioned conformation and balance, good action, sound feet, clean bone and limbs, docility and good temperament are stressed as desirable breed attributes.

The breed enjoys great health and longevity, and also possesses great powers of adaptability as its popularity and distribution in the United States of America, Canada, the South American States and South Africa readily proves. Percherons are frugal, hardy animals under average conditions, and can often fend for themselves under conditions adverse to other breeds.

The breed colour is a dappled grey or black; bays, roans and chestnuts are encountered but constitute less than 2 per cent. and are in disfavour.

The following average weights of Percheron foals reared at the Glen College of Agriculture and at the MacDonald College, Canada, under moderate conditions of feeding and management, should serve as a guide to breeders:—

No. of Colts.	Station.	WEIGHT AT—			
		Birth.	Six months.	Twelve months.	Twenty- four months.
13 409	Glen..... MacDonald College, Canada	lb. 142 120	lb. 739 730	lb. 977 1,020	lb. 1,370 1,480
Average daily gain	Glen.....	—	3·31	1·32	1·08
Average.....	MacDonald.....	—	3·40	1·60	1·25

These figures indicate that under fair conditions the average draught horse bred in South Africa develops as well as that bred abroad, but also that, although our foals are more robust at birth, they lose slightly in successive years, due no doubt to changes in climate, grazing and feeding conditions. The MacDonald colts were liberally fed, while the Glen colts after weaning received additional feed only when falling weights indicated the necessity for it.

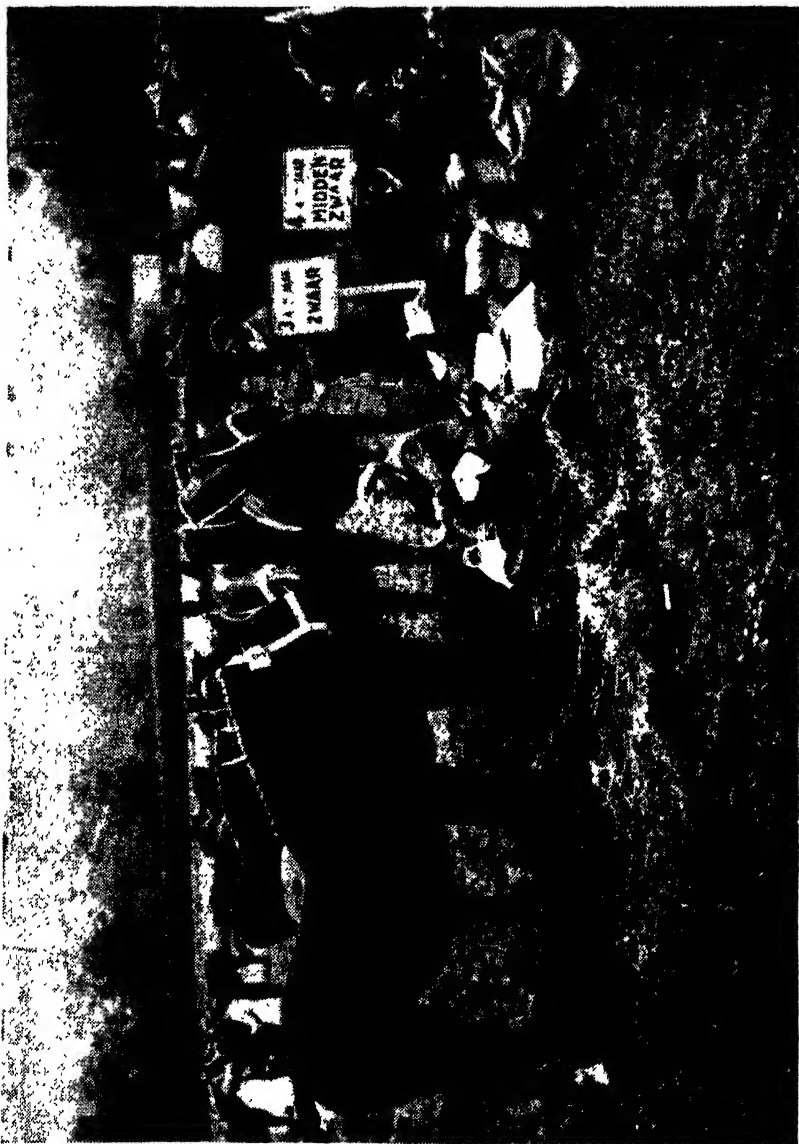


FIG. 7.—Groninger "Landbouwtuigpaard" mares.

It must be stressed that although it is not necessary to have foals in tip-top condition at all times of the year, they should at all stages of their growth have sufficient bone and muscle-building feeds, and not suffer any stunting as a result of nutritional defects.

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(Fuller information obtainable from the British Percheron Horse Society, Haslemere, Fulbourn, Cambridge, England; the Percheron Horse Association of America, Union Stock Yards, Chicago Ill., U.S.A.; and the Percheron Horse Breeders' Society of South Africa, P.O. Box 377, Bloemfontein).

The Suffolk.

The breed was first established from local types in eastern England in the county from which the breed takes its name. Since time immemorial the formative types of the Suffolk were used almost exclusively for farm work, and the modern Suffolk is for "all purposes of agriculture quick at the end of a plough, smart between the shafts in harness, a fast walker in the harrow and a staunch slave at the collar".



FIG 8.—A "Landbouwtuigpaard" stallion (Groninger type).

The modern breed is an improvement from "within the breed", and therefore possesses great purity. Farmers in the Suffolk area wanted a heavy horse which would throw all its weight into the collar with sufficient activity to do this effectively and with enough stamina to endure a long day's work. These exacting demands resulted in the propagation of a horse that was compact in body, well-rounded and thickset in conformation and characterized by well-muscled, short, hard and clean limbs. This combination of features gave an extreme "chunkiness" to the breed, so much so that it is popularly known as Suffolk Punch.

The early promoters of the breed stressed sound hard feet, legs and limbs, and acting on the old adage "no foot no horse" leading shows have since 1875 awarded prizes for "the best feet" among the entries.

Owing to its short legs and compact body, the Suffolk is smaller than other draught breeds, but in weight specimens approximate the weights of horses of other draught breeds. Stallions often weigh as much as 2,000 lb. and measure 16 hands.

The only breed colour is chestnut of varying shades. The more solid shades are popular, while "mealy coloured" chestnuts are not in favour.

It is clean-limbed and devoid of "feathers" on the fetlocks. It is long-lived, courageous and willing, very hardy and thrifty under frugal farm conditions.

Very few Suffolks have found their way to South Africa but those that were imported from time to time created a good impression and were greatly appreciated for qualities readily recognized by good horsemen.

(For more information consult "The Suffolk Horse Society", Woodbridge, Suffolk, England.)

The Harness Type of Horse.

The harness type of horse formed an important branch of the world's horse stock before the advent of mechanized forms of locomotion and transportation. Almost all countries developed special breeds and types that were famed in their day but the harness type has suffered more from mechanization than other types, so much so, that several breeds have disappeared and others have only a limited use as fine harness horses in sporting events.

Famed breeds of the past were the Orloff trotters of Russia which were developed to a high degree of excellence from oriental foundations, the "harddrawer" or trotter of Holland, the Standard-bred (trotter) of the U.S.A., the high-stepping park-driving Hackney, and the heavy harness Cleveland Bay.

The South African horse stock had infusions of blood of the two lastmentioned breeds, and the Hackney still lingers on as a fine harness show driving horse in various parts of the country, but their numbers, as in other parts of the world, are decreasing.

It was in the latter half of the last century that the Hackney captured our fancy as an improver of our deteriorated horse stock and several batches were imported prior to 1888 and up to 1891. The Government of the day was also persuaded by horse-breeding interests to import a large batch of stallions, one condition being that they should be bays; since the breed colour is chestnut of various shades, however, the consignment lacked uniformity.

In 1888 the first Hackney stallions, which cost an average of £272, were placed at Government stud farms for the use of farmers and for the improvement of our horse stock. (On the average each stallion covered 33 mares.)

Private enterprise also imported Cleveland Bays and Roadsters (Norfolk coach horses), but their footing was insecure and these breeds disappeared in the general deterioration that set in towards the close of the last century.

There is no evidence that Flemish horses were imported in large numbers, but some found their way into the Cape districts during the search for "new blood" to rehabilitate our deteriorating horse stock. The Flemish horse, a light harness type, had a strong influence on the horse stock of the south-western districts of the Cape Province in the closing decades of the last century. The interbreeding of Hackneys and Flemish horses on the Anglo-Arab foundations of those days has, in fact, produced new types, the most

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noteworthy of which may be called the "Bolandse waperd" which is a unique type at the leading Cape shows in dashing teams of eight, four and two. Some of these horses are very attractive and useful light to medium heavy harness animals. They are decidedly better than the Flemish, whose colour (black and dark brown) is practically the only attribute still retained.

As a result of selection, many of the harness or trotting traits of the Hackney have been retained, while the good Anglo-Arab foundations assured stamina, style and vigour.

These crossbred types have, however, reached a point where a standard type of breed must be created. Of the present breeds, the Flemish has long since disappeared and the Hackney is becoming rare.

The creation of new breeds according to definite utility standards and specific uses is in progress all over the world, as may be seen in the American Quarter Horse, the Tennessee Walking Horse and the "Landbouwtuigpaard" of Holland.



FIG. 9.—An eight-team of "Bolandse waperde".

The "Landbouwtuigpaard" of Groningen and Gelderland is a medium heavy harness horse used mainly on the land. He is, no doubt, a product of the mixing of blood of the old "Harddrawer" (trotter), Flemish horse and Hackney, and possibly Anglo-Arabs.

It is interesting to note that some of our more distinct "Bolandse waperde" resemble this breed very closely. In fact, there is a definite relationship not only in blood but also in respect of the utility purpose for which both have been produced, namely, the production of a medium heavy but active harness horse suitable for use on the land.

The breeding and fixation methods used in the creation of this breed are of prime importance to the promoters of the "Bolandse waperd".

The harness horse being bred for speed and rapid gait should be of light to medium heavy type. All essential attributes of the good light type and draught type discussed in previous chapters must be demanded in the good harness horse.

[Continued on page 748.]

Marginal Scorching and Chlorosis of the Leaves of Berry Fruits.

Dr. H. L. Pearse, Western Province Fruit Research Station, Stellenbosch.

DURING April, 1946, Professor O. S. H. Reinecke of Stellenbosch University called the author's attention to an unhealthy appearance in the leaves of Boysenberry and Youngberry plants growing on a light, acid soil (pH approximately 4.5) in the Wemmershoek valley. The trouble first became noticeable towards the end of February of that year. Leaves in the middle regions and towards the bases of the new young canes were most severely affected. The earliest symptoms were the appearance of a light straw colour in a narrow irregular band around the extreme margins of the leaflets. In later stages, a brownish to cream chlorosis running from the edges of the leaflets inwards between the main veins became apparent; this colouration, however, rarely extended as far as the mid-rib of the leaf. Finally, in severe cases, the margins of the leaves became badly scorched and dry, and the dark brown dead tissue tended to curl inwards. The appearance of some of the affected leaves is shown in the accompanying photograph.

Although no previous practical knowledge of the symptoms of mineral deficiencies in the leaves of berry fruits had been obtained, from experience gained with other plants and from descriptions in the literature on the subject, it was thought highly possible that these manifestations might be due to a deficiency of either potash or magnesium. During May, 1946, several samples of leaves and shoots were obtained from the affected plantations for examination by the approximate quick test methods for soluble minerals. The samples consisted of (1) leaves from the middle regions of canes showing the symptoms, (2) apparently healthy leaves of about the same age from plants growing in the same area, (3) young growing tips of canes from affected plants, and (4) similar tips from healthy plants.

From the results of these tests it became apparent that magnesium was at a low level in all samples, and furthermore that it was considerably lower in the samples from the unhealthy canes than in those from the healthy ones. The potassium level on the other hand was exceptionally high in all samples, and slightly higher in the samples from the affected shoots than in those from normal ones. The soluble calcium level was about the same in all samples, and soluble phosphorus was very slightly lower in samples from the unhealthy shoots than in those from the healthy ones.

Field Experiment Laid Out.

On the basis of these indications from the visual symptoms and the results of the quick tests, a field experiment was laid out. It is well-known that with most plants there is a marked antagonism between potassium and magnesium. Thus, high levels of potassium absorption are liable to produce low levels of magnesium in the plant and the appearance of magnesium deficiency and *vice versa*. The treatments selected therefore included a fairly heavy application of magnesium sulphate in one series, and an application of sulphate of potash in another with the object of determining if the severity of the leaf symptoms could be influenced in this manner. An application of phosphate as sodium phosphate was also included in two

of the treatments. There were five separate treatments altogether, namely:—

- (1) Ammonium sulphate, 250 lb. per acre.
- (2) Ammonium sulphate, 250 lb.; lime, 1,250 lb.; and magnesium sulphate, 500 lb. per acre.
- (3) Ammonium sulphate, 250 lb.; and sulphate of potash, 250 lb. per acre.
- (4) Ammonium sulphate, 250 lb.; sulphate of potash, 250 lb.; and sodium phosphate, 500 lb. per acre.
- (5) Ammonium sulphate, 250 lb.; sulphate of potash, 250 lb.; lime, 1,250 lb.; sodium phosphate, 500 lb.; and magnesium sulphate, 500 lb. per acre.



Leaves from a Boysenberry plant showing the symptoms of marginal scorch and chlorosis.

The experiment was laid out as a Latin square, with six plants in each plot and two guard plants between each treatment. There were five treatments in each of five rows and a guard row was left between each of the rows containing the treated plots. The applications were made as a broadcast band extending about three feet on each side of the row, and then immediately ploughed in. The treatment was given rather late as heavy rains in late autumn prevented access to the experimental plots, so that the applications had to be made towards the end of September, 1946.

During December, 1946, samples of leaves were collected from the bases of new cane growths from the various plots for examination by quick test methods for soluble minerals. It was found that soluble magnesium was now highest in the leaves from the plots receiving the magnesium sulphate applications, and that soluble potassium was lowest. Soluble potash was highest in the samples from the plots receiving only sulphate of potash and ammonium sulphate, and magnesium was lowest. The sodium phosphate applications had raised the level of soluble phosphorus in the samples from the two series receiving this treatment. It was fairly clear, therefore, that the treatments had achieved the main object for which the experiment had been designed, namely that of varying the relative magnesium

and potassium content of the plants. At the time the leaf samples were taken, however, there was no sign of the unhealthy leaf symptoms.

Towards the middle of February, 1947, the leaf symptoms seen in the previous season began to make their appearance, and it soon became evident that there was a considerable variation in the frequency of their occurrence in the different plots. Accordingly on 3 March, 1947, a record was made of the number of affected leaves and the severity of the symptoms on the plants receiving the various treatments. The leaves showing the symptoms were counted and divided into three different classes, as follows: (1) Severe, (2) Moderate, and (3) Slight.

The first class consisted of leaves showing severe chlorosis and with marginal scorch; the second of leaves showing fairly severe chlorosis only; and the third of leaves which were showing only very slight chlorosis. The results of this survey are presented in Table 1.

TABLE I.—*Incidence of leaf symptoms in Boysenberry plots. Totals for 5 plots in each treatment, each plot consisting of 6 plants.*

TREATMENT.	Number of leaves showing symptoms.			
	Severe.	Moderate.	Slight.	Total.
Ammonium sulphate.....	118	288	132	538
Ammonium sulphate, lime and magnesium sulphate.....	14	73	71	158
Ammonium sulphate and potassium sulphate.....	188	300	125	613
Ammonium sulphate, potassium sulphate and sodium phosphate.....	121	202	97	420
Ammonium sulphate, sodium phosphate, potassium sulphate, lime and magnesium sulphate.....	11	77	74	162

S.E. (Treatment Totals): 76.

It is clear from Table I that the application of lime and magnesium sulphate resulted in a very significant reduction in the number of leaves showing the unhealthy symptoms. In fact, the two series of plots receiving this treatment had a much lower incidence of the trouble than any of the other series. The series receiving potassium sulphate and ammonium sulphate alone had the highest number of affected leaves; this number was in fact greater than in the series receiving nitrogen alone, whereas the series receiving sodium phosphate in addition had a slightly smaller number. The differences between these three series were not, however, statistically significant. The increased number of affected leaves in the plots receiving the potassium sulphate application, however, taken in conjunction with the greatly decreased number in the plots receiving magnesium sulphate, lends additional support to the evidence that the leaf symptoms are due to a magnesium deficiency accentuated by an unbalanced potassium/magnesium nutrition. A row of plants receiving a dressing of lime alone and situated near the experimental block appeared to have as many unhealthy leaves as rows receiving nitrogen alone.

The same type of leaf symptoms has since been found to be prevalent on berry plants growing at Groot Drakenstein and at other places near Stellenbosch. The disorder may therefore prove to be of considerable importance to the rapidly expanding berry industry. The trouble is most likely to develop where berries are being cultivated on acid soils owing to the increased solubility of magnesium under such conditions, and is likely to be aggravated by potash applications. The levels of application used in this experiment were specially designed for an attempt to diagnose the cause of the leaf symptoms and must not be taken as indicative of the correct levels to use in practical cultivation. More work needs to be done before the most economic control measures can be given. From work carried out in other countries, however, it appears that magnesium sulphate applications of from 50 to 100 lb. per acre have sometimes resulted in improved yields and better quality fruit from berry plantations.

Acknowledgment.—The author would like to thank Professor O. S. H. Reinecke for his stimulating interest and assistance during the course of this work.

Toxic-Smoke Generators for Termite Control:—

[Continued from page 727.]

Acknowledgments.—The writer is indebted to the following for assistance freely given:—

- (1) Messrs. Imperial Chemical Industries, Ltd., Messrs. African Explosives and Chemical Industries, Ltd., and Messrs. Cooper and Nephews, Ltd., for making available for testing purposes supplies of "gammexane" smoke generator No. 12 and other B.H.C. formulations;
- (2) The Division of Chemical Services, for the formulation and preparation of the earlier type of generator tested;
- (3) Mr. B. K. Petty, of the Division of Entomology, for assistance in toxicity experiments.

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Enquiries About Plant Diseases.

All enquiries about plant diseases and specimens may be sent to the Chief: Division of Botany and Plant Pathology, P.O. Box 994, Pretoria. Farmers from Natal may also forward theirs to the Officer-in-Charge, Botanic Station, Botanic Gardens Rd., Durban; those from the Transvaal Lowveld to the Plant Pathologist, Sub-Tropical Experiment Station, Nelspruit; and those from the winter-rainfall area to the Principal, Stellenbosch-Elzenburg College of Agriculture of the University of Stellenbosch. Furthermore, enquiries and specimens may also be sent to any of the colleges of agriculture in the area concerned. (The necessity for concerted action in the combating of serious plant diseases is mentioned in the editorial article in this issue.)

The Control of Fruit Flies:—

[Continued from page 730.]

The spraying times can also be judged by the condition of the fruit to be protected. A few days before peaches lose their astringent flavour, is the correct time to start spraying. In practice this is about five or six weeks before the fruit is ripe. For the Transvaal yellow peach, however, the spraying should commence two or three weeks earlier because this variety sweetens very much sooner than the others. Even when the fruit appears quite green, it has matured sufficiently for the fly to sting it and the eggs will develop successfully. In this case the baiting should be done when the fruit is about half grown. Make applications at least once a week when the fruit is developing normally, and twice a week when particularly warm, dry conditions prevail. Early peaches ripen irregularly over a long period, ripe and quite immature fruits being found on the same tree. In such cases the most advanced fruits should be tested as indicators.

Baiting should be repeated if rain washes the bait off the trees. In towns and on irrigation settlements where fruit is grown in gardens and on small plots which are close together, it is very necessary that people should co-operate to control the fruit fly. Farmers' associations should organize the baiting, so that whole areas may be cleared of the pest. In some cases it may be necessary to apply the Orchards and Cultivated Plants Cleansing Act.

The new insecticides such as D.D.T. and benzene hexachloride, although very toxic to flies, have not proved effective in the control of fruit flies so far, but investigations are proceeding and in time methods of using them may be developed. Great care will have to be exercised in this case, however, to ensure that beneficial insects in the orchard are not destroyed and that the whole biological balance is not upset.

The Lucerne Caterpillar.

E.E. Anderssen, Entomologist, Division of Entomology, Pretoria.

SINCE this is the time when lucerne caterpillar may occur in lucerne lands throughout the country and become a serious menace, a few hints on its control will not be out of place. This is the most important insect pest affecting the successful cultivation of lucerne.

The adult female insect is an orange coloured butterfly which oviposits exclusively on lucerne leaves. As soon as the young caterpillars are hatched, they begin to eat and their presence can soon be detected from the appearance of the crop.

Although this insect attacks lucerne of any age it is noteworthy that the infestation spreads from the older to the younger stand according to the ovipositing habits of the butterfly. Cases also occur where the caterpillar shows a tendency to attack new growth in cut lucerne as soon as it has reached a height of a few inches. It has not been found, however, that the caterpillars readily move from one land to another and it may safely be assumed that butterflies must appear in a stand before the caterpillars will be found there.

The fact that lucerne usually becomes infested in the order of age, is not accidental, but may be ascribed both to the fact that the butterflies select young lucerne plants and to the farming practice of cutting the lucerne in the flowering stage in order to obtain the heaviest and therefore the highest yield. If the crop is cut at this stage, a week to ten days must elapse before there is sufficient new growth to attract the butterflies. The eggs are hatched from four to eleven days after ovipositing, and by this time, lucerne under irrigation has made considerable growth.

In practice, however, lucerne may be infested at any stage of growth and it is, therefore, important to keep a watchful eye on the crop.

Several generations of these caterpillars occur in the course of the year, and where control measures are applied by individual farmers where the adjoining farms may serve as a source of infestation, more than one treatment will be required. As a rule, however, lucerne grows rapidly under irrigation and a single treatment per cutting should be sufficient. It has even been found that some cuttings remain practically free from infestation and mature without any treatment.

Control measures against the caterpillars should be applied as soon as the damage becomes noticeable. The butterflies live on nectar from any type of flower, including lucerne flowers, cultivated flowers or wild flowers such as devil's thorn, etc. It is interesting to note how thousands of these butterflies fly away in the morning from lucerne which has not yet reached the flowering stage, to look for food, returning again towards sunset in order to continue their ovipositing.

The presence of large numbers of butterflies is a sign that the lucerne is, or soon will be, infested with caterpillars and the farmer should be on the alert at such times. In practice he is the one to decide whether or not he is going to apply control measures and he will usually have a choice, unless the lucerne is very young and its cutting, therefore, unprofitable. As a rule, lucerne which is to be cut in a day or two, is not treated but rather cut as soon as possible.

The caterpillars tend to leave the wilted lucerne which is drying on the land after cutting, and to hide in the stubble. In these circumstances they will either pupate or die of disease, especially if irrigation is applied.

Treatment.

If chemical treatment becomes necessary, the following procedure should be followed.

Cryolite powder is regarded as the best stomach poison and about 20 lb. per morgen is required for successful treatment. The aim is to dust thinly but as evenly as possible, in order to cover the entire leaf surface of the lucerne plants. At best, the cryolite does not adhere very well to lucerne leaves, but proper dusting will nonetheless ensure successful destruction of the caterpillars.

How soon the caterpillars die, depends, of course, on the quantity of powder consumed with the leaves, but even if this is not sufficient to kill the insect, the latter soon loses its appetite completely. Such caterpillars ultimately die of hunger or are forced by hunger to eat more of the poisoned lucerne, which kills them.

A thorough and even application is therefore of the utmost importance if success is to be achieved.

The powder is applied by means of rotary dusters or power machines. The latter are, however, less economical for this purpose and considerable experience is required for handling the machine successfully.

Where neither hand-operated nor power machines are available, the powder may be applied effectively by hand. In this case the powder is carried in fairly closely woven linen bags, which must be securely tied. The poison is deposited by simply shaking the bags over the plants. So far cryolite has undoubtedly yielded the best results in the control of the lucerne caterpillar, and farmers are advised to use it. For the eradication of this pest, however, united and simultaneous action by all the farmers in the infested area is necessary.

Fairly regular supplies of cryolite are now being imported and farmers would be well advised to keep supplies on hand and be prepared for any emergency. Farmers are also advised not to buy their supplies personally, but through their own association, with a view to economising on costs.

About three hours' exposure to cryolite is usually sufficient to destroy caterpillars of all ages. If the weather is unfavourable, dusting should be postponed.

The Horse on the Farm:—

[Continued from page 741.]

The conformation should be comparatively long, narrow and deep, with great muscular appearance, with a tendency to angularity rather than blockiness or thickness of form, while rapid and true gait is imperative. For our limited use of harness horses, careful selection on "harness lines" from our existing light types will readily fill the restricted demand. Invariably such horses will possess a dash of Hackney blood or a mixture of "harness" blood that still remains in certain local types.

The Fusicladium or Scab Disease of Apples.

II.—The Origin of the Initial Infections Each Year.

Dr. A. J. Louw, Western Province Fruit Research Station.

SOME growers attach much value to winter spraying for apple scab. This view is based on the belief that any remnants of the causal fungus on the dormant trees is thereby exterminated, as is the case with various other fungus diseases, e.g. curly leaf of peach trees and anthracnose of vines. The causal fungi of these diseases hibernate on the dormant shoots of the peach tree and vine, respectively, from which the new infections develop during the growing season. The value of winter spraying for apple scab will, therefore, depend on the extent to which the initial infections of the season originate from old scab spots on the shoots of the previous year.

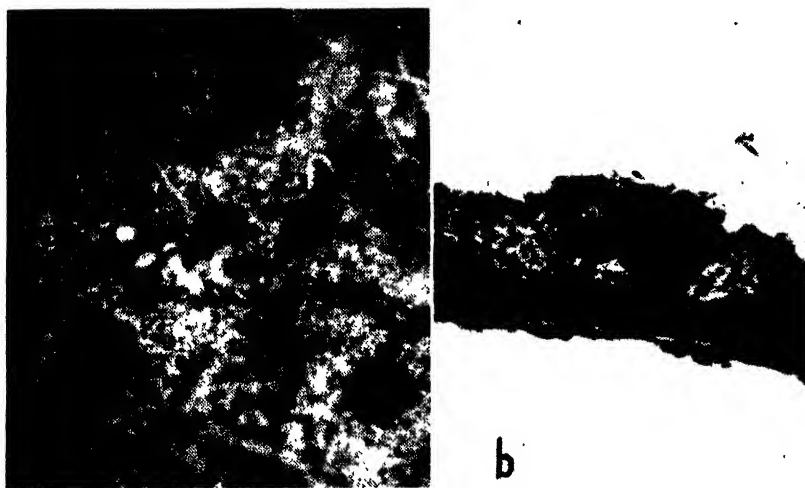


FIG. 1 (a).—Portion of overwintered apple leaf showing the black fruiting bodies which develop during the winter in the old Fusicladium spots, and in which the winter spores of Fusicladium are formed. (Magnified 50 times.)

(b).—Cross-section of portion of an overwintered apple leaf showing how the fruiting bodies bearing the winter spores of Fusicladium develop within the leaf issue. (Magnified 120 times.)

It was found in certain regions of the northern Hemisphere that the scab disease occurs on the shoots and bud scales of apple trees, from where it can spread to the young leaves and fruit during spring. A study of the life history of the causal fungus under local conditions has, however, shown that in the winter-rainfall area of the Cape this form of hibernation is of no importance. The old infected leaves which have been lying on the ground during winter form the only important initial source of infection in this area.

When the infected leaves fall from the trees at the end of summer, the fungus develops further on the leaves while these are lying on the ground during the winter. Small bodies develop which appear as black specks in the old scab spots. [Figure 1 (a), (b).]

In these bodies the winter spores of the fungus are formed at the end of the winter. [Figure 1 (c).]

No infection can take place until after the trees have foliated. If however, the spores land on leaves and fruit during wet weather, they germinate [Figure 1 (d)] and cause the first infections of the season. Within approximately ten to fourteen days the well-known black spots develop on the leaves and fruit. [Figure 2 (a), (b).]

These spots represent the summer stage in the life cycle of the fungus [Figure 2 (c)]. The black powder on the surface of the scab spots consists of masses of summer spores of the fungus. When the surface of a leaf or fruit becomes wet, these spores become separated from the stems on which they are borne. The rainwater then carries them to other leaves and fruit where they germinate [Figure 2 (d)] and within 10 to 14 days cause new scab spots to develop, which, in their turn, can produce summer spores.



FIG. 1 (c).—A section through one of the fruiting bodies showing how the winter spores originate within them. (Magnified 500 times.)

The summer spores serve to spread the fungus during the growing season and can only be conveyed from one part of the tree to another by means of water, e.g. rainwater or dewdrops. Under orchard conditions these summer spores retain their viability for only a short period, depending on weather conditions. It has been established in tests that they cannot survive the winter months under natural conditions, and cause infection in the following spring. The only source, therefore, of the primary infections each year are the old apple leaves of the previous summer which have been lying on the ground of the orchard during the winter. *Spraying of the trees during winter can, therefore, have no effect on the disease.*

From the above outline of the life history of the fungus which is responsible for the scab disease, it is evident that the fungus is

THE FUSICLADIUM OF APPLES.

most vulnerable during the period when the primary infections occur. If, during this period the winter spores are allowed to germinate on the sprouting leaves or blossoms of the apple tree and to establish the disease, the latter will thereafter spread during the entire growing season, with every rain, and even with the dew at night. On the other hand, if the apple tree is successfully protected against the primary infections during the period of winter-spore liberations,

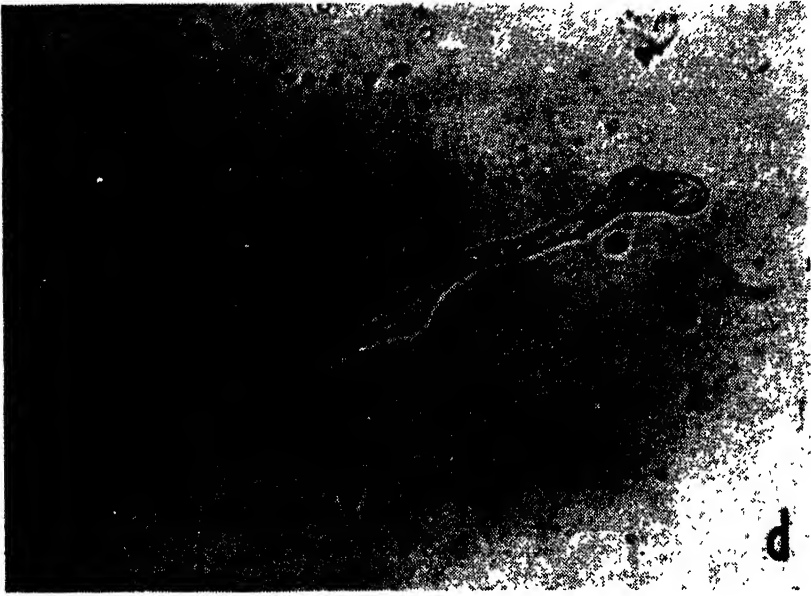


FIG. 1 (d).—A winter spore germinating after liberation. (Magnified ± 900 times.)

the disease will cause no trouble during the summer months and the grower will be able to give all his attention to the control of the codling moth.



FIG. 2 (a).—Apple leaf with Fusicladium spots.
(b).—Apples with Fusicladium spots.

The principle on which the control of apple scab is based, is to prevent the primary infections *by a series of protective spraying*

operations over the period of winter-spore liberation. When the apple trees start budding, the winter spores of the scab fungus in the old leaves on the ground are already ripe and they are discharged into the air whenever it rains. The trees must be protected against these spores by a layer of the spray, maintained on every leaf from the time the apple tree starts budding. For maximum efficiency the spray must cover the entire surface of the leaf or fruit, since the spores of the fungus must actually germinate on the spray itself if they are to be killed. The winter spores are liberated in the orchard in very great numbers. By means of countings on leaf portions it has been calculated that a single apple leaf can contain as many as 1,750,000 of the winter spores. Moreover, if it be considered that the spores are exceedingly small ($1/500$ inch long), it will be realised that even a minute portion of a leaf or fruit not covered by the spray, is a potential channel for infection.

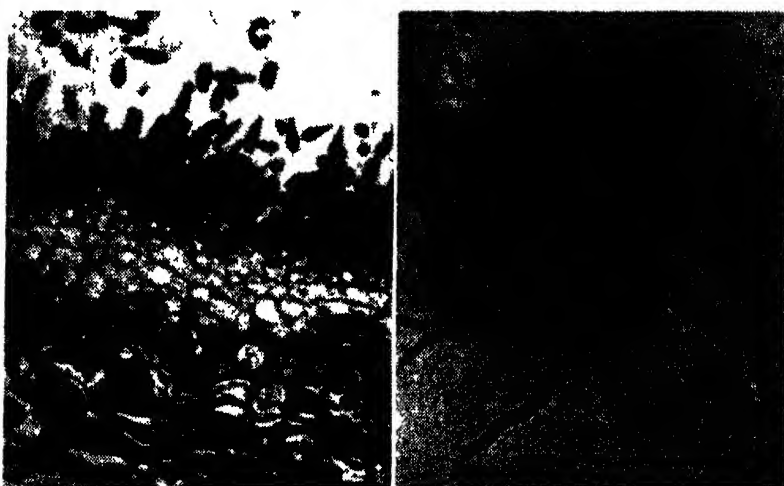


FIG. 2 (c).—Section through a *Fusicladium* spot on an apple, showing how the fungus grows on the surface of the fruit and forms the masses of summer spores. (Magnified ± 360 times.)

(d) Germinated summer spores of the fungus. (Magnified ± 900 times.)

The spray covering on the surface of the developing leaves and fruit should be maintained as long as the critical period of primary infections lasts—in the winter-rainfall area this period generally extends to about the middle of November. The duration of this period, however, depends on the weather conditions preceding it. If very little or no rain had fallen during the preceding months, few of the winter spores will have been able to escape from the old leaves and good rains late in November and even in December could under such circumstances, result in the discharge of large numbers of winter spores and heavy infections. With good rains in September or October few spores will, however, have remained in the old leaves by November, with the result that if apple trees at this stage show no signs of the disease, no further spraying operations will be necessary.

The Common Reed for Soil-Erosion Control.

Roscar du Toit, Officer-in-charge, Tarka Conservation area.

FORMERLY, the Vlekpoort valley was one of the best hunting areas of the Union. According to old writings, hunters even came from overseas to hunt big game here. At that time the area was characterized not by rivers, ditches and Karroo bush, but by natural vleis, densely covered with common reed (*fluitjiesriet*) and undergrowth as well as excellent grazing consisting for the greater part of the finest grasses such as "rooigras", buffalo grass, "blousaadgras" etc. To-day the valleys are very severely eroded and traversed by deep river channels and gullies, and the grass pasturage has been almost completely ousted by Karroo-shrubs which cannot provide sufficient covering to prevent further erosion by water or wind.



FIG. 1.—Reeds encircling a brack pillar.

This erosion was caused by wrong farming methods. The first farmers regularly burnt the vleis in order to destroy wild beasts such as tigers and to obtain short green grazing periodically. The result was that in the course of time the vleis became rivers. Another common practice was that of breaking up the natural dykes holding the earth together, and in this way draining the portions which were too damp for agricultural purposes. The rivers which were vleis before, rapidly carried away the rainwater. The deep soils were drained more and more; the water table sank rapidly; the grasses began to disappear and gradually the veld became Karroo. The deep and highly erodible soils were rapidly washed away and deep gullies were formed from the low-lying rivers as a result of the well-known headward erosion, extending as far as the summit of the Bamboes mountain. At present about 5,000 tons of soil per square mile are carried to lake Arthur during each rainy season.



FIG. 2.—*In the background: Reeds in the process of invading a side-sloot.
In the foreground: Typical brack which is also gradually being invaded.*

The Vlekpoort valley was proclaimed a conservation area under Act No. 13 of 1941, and in 1942 the activities were commenced at the foot of the Bamboes mountains.

For the greater part, the coarse particles which were washed down, were caught up by embankments built through the gullies. The capacity of the dams against the slopes at the foot of the mountain is, of course, comparatively small, and consequently very little water and silt can be retained here. Most of the water therefore still flowed away, carrying with it the finer soil particles.

It was clear that operations had to be commenced mainly from the base with a view to inducing a gradual filling up of the sloots from the lower end, and as more and more eroded farms were bought and more manpower and implements became available, the construction of a series of weirs in the Vlekpoort river itself and at strategic points in the main draining tributaries was commenced. From the

Vlekpoort river, as the lowermost and main draining channel, a series of weirs was planned, a number of which have already been completed. A dam of this type is rapidly closed up—usually as far as the full water mark—within one season. The problem now is to bring about silting upstream in the direction of the mountains.



FIG. 3.—The head of a strip of reeds advancing upstream in a brack slot.

In the case of rapidly flowing rivers, one does not immediately think of vegetation in some form or other, since the young plants have no chance against the velocity and force of the water, heavily laden with soil particles which, in the words of Dr. Bennett of the U.S.A. are "too thick for porridge and too thin for ploughing". Considerable attention was then given to temporary barricades to catch up the silt before the weirs and in this way help the process of back silting. Various types of barricades were tried out but none could resist the rapid and heavily laden flood waters.

In the meantime attention was given to grasses and other crops which might be useful to cover and to hold the silt. Grasses such as kikuyu, *Panicum repens*, Makarikari, elephant grass, kuzdu, Rhodes grass, finger grasses, etc., have proved unsuccessful in a greater or a lesser degree. The only hope was to make use of plants which flourished in the valleys years ago in the natural state. Fortunately common reed, practically unobtainable in the area at present, took the lead from the outset and to-day this crop plays a leading rôle in catching up silt and helping to accomplish the process of back silting. In addition, the growing of common reed offers a solution to the problem of designing effective barricades. Now only concrete weirs of the standard type are built in key positions and the silting process is further facilitated by common reed in order to build up the silt along the particular curve as far as the foot of the mountain.

The accompanying photos show how the silt caught up by weirs in the Vlekpoort valley is covered and held by common reed, causing further silting upstream. Common reed is well-known in every

district in South Africa. As shown by the last portion of its technical name, *Phragmites communis*, these plants grow together in a compact mass, making the reed ideal for the purpose for which it is used. In addition, the plant has other special advantages in that the

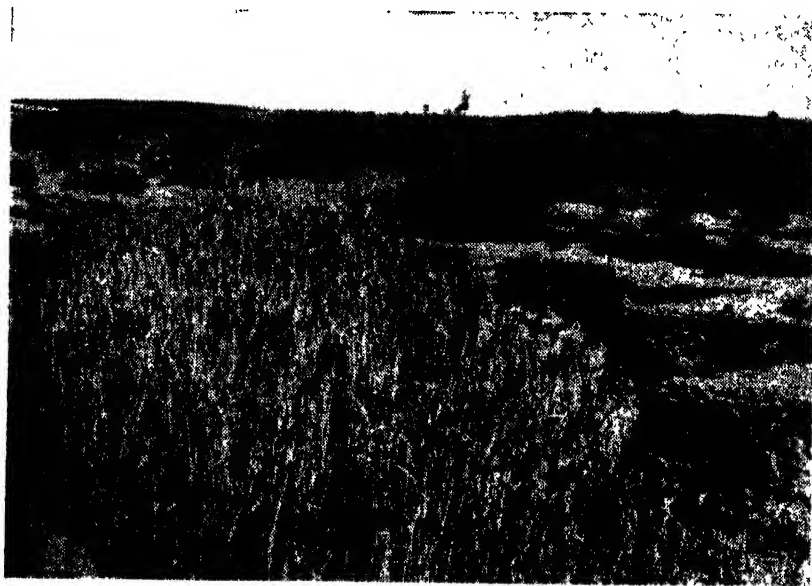


FIG. 4.—Another brack sloop in which the reeds are growing luxuriantly. Willows in the background.

parent stem is self propagating by means of aerial and subterranean runners. Furthermore, its dense growth has the additional advantage of damming up the floodwaters, thus giving the plant a better opportunity to spread rapidly, moving upwards in the gullies where it grows



FIG. 5.—Reeds working their way into the side-sloots.

THE COMMON REED FOR SOIL-EROSION CONTROL.

in the water and silt caught up. Runners of 20 ft. are very common and one of 51 ft. has even been found during a growth period of only one season. Last but not least, the common reed also offers palatable grazing for cattle and is not so easily destroyed if a controlled grazing system is applied.

With its present achievement, common reed is worth more for erosion control in the Vlekpoort valley than any other known plant and if this plant can again flourish as in the days of yore, it will be the most important means of controlling soil erosion in these parts.

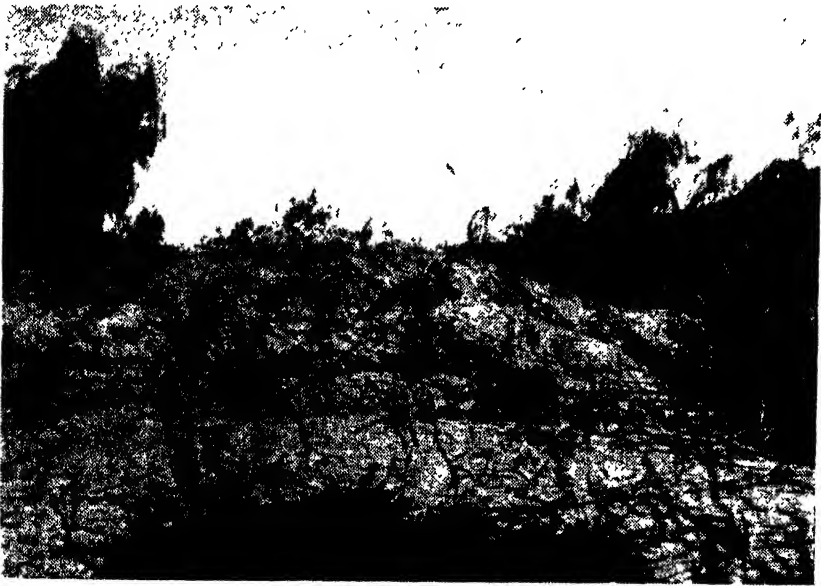


FIG. 6.—Reed runners invading a brack patch. The mother plants are already well established in built-up silt.

Nursery Quarantines.

The following nurseries were in quarantine as at 1 September 1947:—

- (1) Mooi-uitsig-Kwekery, Private Bag, Nelspruit, on citrus (all) for red scale.
- (2) Smith's Nurseries, Johannesburg, on citrus (all) for red scale.

New Bulletins.

The undermentioned Bulletins have recently been published:—

Bulletin No. 248. Duck Farming, Price 6d.

Bulletin No. 264. Turkeys, Price 3d.

Bulletin No. 192. Control of Household Insects, Price 6d.

These Bulletins are obtained from the Editor of Publications, Department of Agriculture, Pretoria.

Fruit-sucking Moths.

Dr. B. Smit, Principal Entomologist, Division of Entomology.

DURING February of each year the Division of Entomology receives many letters about fruit-sucking moths. These moths cause a considerable amount of damage to ripening fruits of many kinds, including stone fruits and citrus. The moths are large insects with grayish brown wings measuring about 2½ inches across when extended. They are strong fliers and sometimes become so abundant that in an orchard they give the impression of a swarm of locusts. They fly up out of the trees when disturbed during the daytime, but are more active at night and most of the feeding on the fruit is done during the hours of darkness. The moths have large compound eyes which reflect the light and shine at night in the rays of a torch or a lamp. Most kinds of moths do not feed much and in many species the mouth-parts are degenerate and useless, but in the case of the fruit-sucking moths the mouth-parts are well developed and fitted for piercing the fruit. The proboscis, when not in use, is coiled up under the head like a small watch spring, but when extended is about an inch long and has a sharp tip with saw-like cutting edges along its sides which enables the moth to bore holes in fruit that is quite hard. The insect has no sting at its hind end and cannot "sting" fruit as some people imagine.

There are at least three common species of fruit-sucking moths in South Africa, belonging to the three distinct genera *Achaea*, *Serrodus* and *Sphingomorpha*, but if these moths were studied more carefully, more of them would probably be found. On the west coast of Africa there are many more species and they are a major pest in citrus groves there. All three of our species are indigenous and are particularly troublesome in orchards near wild trees and bush. This is because they develop in their larval or caterpillar stages on wild trees, but unfortunately very little is known about their natural host-plants.

The larvae of *Achaea lienardi* have been recorded on wattles and tambootie trees in Zululand and on sneezewood, milkwood, wild currant, wit-hout, boerboon and bergpruim (mountain plum) at Bathurst, but we have no host records for the larvae of the other two species. There is a fourth species called *A. catella* which has been recorded as a pest of apples, and the larvae of this have been found feeding on castor oil and dubbeltjie plants. Apparently this species is not yet a bad pest.

Fruit-sucking moths have been a more serious pest in the eastern parts of South Africa from Natal right down along the coast to Port Elizabeth, but in some years they have been much worse than in others and in 1944 practically all the fruit-growing areas in the country were affected. In that year the pest was more than usually abundant in the Langkloof and the western Cape Province, whereas usually it is considered to be a pest more particularly of the eastern Cape Province. No doubt such fluctuations occur as a result of climatic conditions which are favourable for the breeding up of the moths in great numbers in the bush, but unfavourable to their natural enemies.

In the western Cape Province, apples, pears and grapes in particular are subject to attack, and the chief culprit there is *Serrodus inara*. In other parts of the country peaches and guavas appear to be the favourite fruits of the fruit-piercing moths, *Achaea lienardi* being the worst species.

CONTROL OF FRUIT-SUCKING MOTHS.

In the Albany and Bathurst districts ripe citrus fruits are often severely attacked.

Fruit is preferred when it is quite ripe, but in the absence of such fruit "picking ripe" fruit is also attacked. The moth sucks the juice from the fruit by inserting its proboscis to its full length after making a round hole in the skin, and the mouth-parts are then withdrawn at intervals and re-inserted sideways, so as to get the juice from a fairly large area. In this way a dry, spongy mass of tissue is found under the skin which later collapses and rots. From the outside, the injury resembles that caused by the fruit fly and that is why farmers talk about the fruit being stung, but, if the fruit is cut open and examined, the dried out area will be noticed and no fly maggots will be found.

Great care should be taken not to pack and sell such fruits that have been pierced because they soon begin to break down and rot and then become a menace to the whole consignment.

Control of Fruit-sucking Moths.

As with all insect pests that breed in wild vegetation, the control of fruit-sucking moths is a difficult matter. The eradication of their natural food-plants is impractical and we must therefore rely on control measures applied within the orchard. It is against the adult moths that we must direct our campaign in this case.

In small orchards and gardens a great deal of good can be done by hand collecting the moths in the early morning while they are still numbed from the cold. In some cases the trees can be shaken, so that the moths fall to the ground, where they can be killed by beating them with a bundle of sticks.

Where the moths are very abundant they can also be collected at night by the light of a lantern and thrown into tins containing water with a little paraffin floating on it. While feeding they are very sluggish and can easily be caught by hand. They are not attracted by lights, however, and trap lanterns for this pest have proved a failure.

Some work has been done on the problem of trapping the moths, but unfortunately no really attractive bait has yet been found. Where fruit is ripening on the trees, nothing appears to be more attractive to the moths than this fruit, but where fruit is not yet ripe certain baits exposed in large tins hung in the trees have attracted large numbers of moths. There are probably other factors involved besides the ripeness of the fruit, but under certain circumstances this trapping method may be of some use. It is given here in case an opportunity of using it arises, but it cannot be relied on.

Use four-gallon paraffin tins or tins of similar size. Cut across two opposite sides about five inches from the bottom and continue these cuts along the four corners to within an inch of the top of the tin. The two flaps thus formed are now bent outwards, leaving two large square holes in the sides of the tin with sloping verandahs over them.

The bait is made with a sugar solution or syrup and ripe fruit to attract the moths and a stomach poison is dissolved in it, to kill the moths if they feed on it. The best poison is sodium fluosilicate, which does not repel the moths or stop fermentation of the bait. If oranges are used, they are cut in half and floated in the bait so that the cut surfaces are exposed for the moths to settle on.

The usual formula is as follows:—

4 gallons of water.

2½ lb. of white sugar.

2 ounces of sodium fluosilicate.

A few ripe fruits placed in each bait trap.

The traps are hung in the trees where the moths are most abundant and are suspended in the outer branches where the moths can easily find them. The bait should be renewed about every ten days and the traps should be set out several weeks before the fruit begins to ripen. As has already been explained, these traps are often quite ineffective when there is ripe fruit in the orchard.

The most practical method of avoiding severe loss when there is an outbreak of fruit-sucking moths is usually to pick the fruit as soon as possible, but a few trees should be left unpicked at regular intervals throughout the orchard to serve as trap trees. The fruit on these trees is allowed to ripen and attract the moths from the other trees from which the fruit is being picked. If there are different varieties of fruit in the orchard and the fruit ripens unevenly, the trap trees should be those with the ripest fruit. If the infestation of moths is coming from any particular side of the orchard, more trap trees should be left on that side to intercept the invasion. This must be decided according to circumstances.

Horse Improvement Scheme „B” for Farmers.

This scheme which was inaugurated in the 1938/39 season, is now in its ninth year and some 1,600 mares have been served since then, the actual figures being 789 by Percherons, 773 by Thoroughbreds and 102 by Donkey Jacks.

The scheme enjoys the support of farmers, to their great benefit. The season begins on 1st October and ends on 31st January. No mares will be accepted after 15th December.

As this is a service that coincides with other pressing and seasonal farming activities at the Colleges and Stud Stations, preference will be given only to the best type of mares. Mares must be halter-tamed and in good breeding condition. The officers in charge will exercise the right to return undesirable types of mares and also mares in poor condition.

Owing to the after-effects of drought conditions and other circumstances mares cannot be accepted this season at the Glen, Elsenburg and Grootfontein Colleges.

Percheron and Thoroughbred Stallions are available at the Potchefstroom College and at the Veterinary Research Station, Ermelo; Jacks (A and B schemes) also at Potchefstroom; and Percherons only at the Cedara College, the Athole (P.O. Ermelo) and Dohne (P.O. Dohne) Pasture Research Stations, the Meadows Industrial School (Dewetsdorp), and the Oakdale Agricultural High School (Riversdale).

Full particulars are obtainable from the above institutions.

The Farm Home.

(A section devoted mainly to the interests of
Farm Women.)

Ostrich Feathers in Fashion.

Miss. Joyce de Jong, Home Economics Officer,
Department of Agriculture.

OSTRICH feathers appeared as an article of personal adornment in France during the 15th century. After this they were never out of fashion for any length of time. They were popular during the Renaissance as trimmings for men's hats, and the reign of Louis XIV brought their use on the tricorne and on children's and women's hats. In England, the Tudors, Stuarts and George I favoured their use. Marie Antoinette wore them extensively in her hair, and ostrich feathers also graced the bonnets of the French Empire period. During the "naughty nineties" they were again very much in fashion and at the turn of the century boas were immensely popular. The present renewed interest in ostrich feathers has resulted in their being put to many uses again. Not only are small boas now popular for trimming the neckline of capes, but ostrich feathers are also being used for the adornment of evening frocks and for headdresses, fans, evening bags, capes, etc.

Plucking and Treatment of Ostrich Feathers.

Feathers intended for the purposes indicated above, demand careful attention during plucking as well as special treatment in their preparation for articles of feminine adornment.

When the ostrich is six months old, the spadonias or swordlike chicken quills are plucked; eight months later the plumes are plucked for the first time. The best white plumes are obtained from the wing of the male bird at the second plucking. The black feathers grow in two rows next to the white ones on the wing.

The better plumes are 26 inches long from the tip to the end of the quill, and 12 inches to 14 inches wide. The feather must be symmetrical, and the tip must be blunt and slightly curled back. The feathery part or down must radiate perpendicularly from the quill and form an even, stout fringe, and must be strong, broad and closely set together. Further, the quill must be strong without being stiff and there must be no cross markings.

After plucking, the feathers are treated to remove fattiness, bleached if necessary, and then dyed and/or stiffened. All these processes may easily be done at home.

Fashionable Articles from Ostrich Feathers.

A number of very beautiful articles can be made at home from ostrich feathers. Ostrich feathers are perhaps most popular for evening wear since they have an ethereal beauty that is enhanced by the sparkle of jewellery and coloured lights.

Platted Halo and Ringlet Headdress.

Coloured plumes for evening wear in the hair are in very good taste. A platted halo is easily made. Steam a feather to soften the quill, bend to the shape of the head and fasten in position till it is dry. Steam and bend again if necessary. Cut off the desired length, and, holding the plume end towards you, take a bunch of down $\frac{3}{4}$ inch wide from the right side and fold over to the left, pressing it down



FIG. 1.—A chic cape and open fan.

with the left thumb. Replace the left thumb with the right thumb and repeat the process from the left side. Tie the down together at the point and paste to the wrong side with milliner's glue. Line with ribbon and attach an elastic band. Trim off loose down.

Choose a feather with strong down to make a ringlet headdress. Steam and bend as above, and cut off the feathery part to 2 inches.

OSTRICH FEATHERS IN FASHION.

Take $\frac{1}{2}$ -inch bunches of this, curl with the back of a knife and twist round the little finger to form a lock. Repeat on both sides of the quill, line with ribbon, and attach elastic.

Fans and Evening Bags.

From five to twenty-five feathers can be used for making a fan. The quills must be straightened. This is done while they are wet from washing or dyeing, by weighting them down under a clean cloth



FIG. 2.—The outfit is rounded off by the elegant evening bag and attractive headdress.

for a few days. Cut the feathers to the required length. Down must be present along the whole of the required length. Choose the longest feather for the centre. Handles for folding fans are available in bone,

tortoise shell, ivory, etc., and have from seven to fourteen blades, according to the number of feathers to be used. This number will be found to make a fine fan for evening use. Scrape the back of the feathers and remove some of the soft pulp in the quill. Paste the blades to the feathers, weighting down till dry. The first blade of the handle is pasted to the *front* of the first feather since it is usually ornamental. Join the blades together. Ribbon is threaded between the blades to prevent the fan from opening too far. The down may now be curled slightly.

Ostrich feather evening bags are dainty and easily made by sewing tips on to a bag of georgette or crêpe de chine, stiffened with organdie or buckram.

Capes.

Capes made from ostrich feathers are very practical, since they are light and warm. Make a yoke of crêpe de chine or georgette. The quills of the feathers must be removed. This is done by scraping and pulling off the skin from front and back of the feathers. Pull off the down, starting at the top.

Work the feathers $1\frac{1}{2}$ inches apart to the yoke with a matching silk thread, using buttonhole stitches $\frac{1}{2}$ inch to $\frac{3}{4}$ inch apart. Strengthen by sewing in an extra thread.

A very lovely effect is obtained if the feathers are first steamed and the ends twisted in opposite directions to form "tails". Shake to dry them in this position and then sew them to the yoke-piece.

Trimmings.

The down may also be sewn to the yoke like a fringe, crosswise, with each row overlapping the previous one by 2 inches. Ostrich feather fringe (the down stripped from the quills and sewn on to a strengthening thread) may be ready-bought. It is also available as "ruching" or a twisted fringe. These can be used as frock trimmings, as can tips or even whole feathers. They are especially beautiful as shoulder or sleeve decorations on off-the-shoulder old-world evening dresses.

Ostrich feather hat trimmings have been made extremely popular through their use by the Queen. Usually the shorter white tail feathers of the male birds are used. These are bleached, dyed, curled and stiffened in various shapes and sizes. Perhaps the simple curved feather that softens the hairline on a tip-tilted hat is the most becoming.

Pompons and flowers are made by stripping the down from the quill. Use the thinnest fuse wire obtainable to fasten the petals to ready-bought stamens to make softly-becoming flowers. Crêpe paper neatens the tip of the stem. Rubber cement, obtainable from any garage, is used if the feathers have to be pasted together. Stamens can be made at home by dipping strands of stiffened cotton or string in melted crayons or sealing-wax. These trimmings can be used as boutonnières as well as on hats.

Many women are wearing detachable feathers on hats which ~~must~~ do duty for a morning in town, or a garden party, or for a funeral or a wedding.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

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Price Review for July, 1947.

Fruit.—Good quantities of avocados, guavas and limited deliveries of granadillas were disposed of at satisfactory prices. Papaws were well represented, but only moderate quantities of pine-apples were offered. Oranges were offered in large quantities, but limited supplies of lemons and grape-fruit reached the markets, and experienced a strong demand. Apples were still plentiful and the demand moderate.

Tomatoes.—Still larger quantities of tomatoes reached the markets and further price reductions took effect. On the Johannesburg market, for example, the prices of National Mark No. 1 tomatoes decreased from 5s. 2d. to 3s. 8d. per tray, those of ordinary tomatoes on the Cape Town market from 4s. 4d. to 2s. 3d. per tray, and on the Durban market from 1s. 11d. to 1s. 9d. per tray.

Potatoes.—Potatoes were still plentiful and sales satisfactory.

Onions.—The supply of onions decreased and prices increased. For example, on the Johannesburg market the prices of Transvaal onions increased from 26s. 2d. to 31s. 5d. per bag; those of Cape onions on the Cape Town market from 23s. 3d. to 25s. 2d. per bag; and those of Cape onions on the Durban market from 27s. 2d. to 34s. 5d. per bag.

Vegetables.—Large consignments of carrots, cabbage and cauliflower were disposed of at satisfactory prices. High prices were realized for moderate consignments of green beans, green peas, gem squashes and marrows, as well as for moderate deliveries of lettuce and beetroot. Pumpkins and turnips were well represented; cucumbers were, however, still scarce and expensive.

Seed, Fodder and Grain.—Dry peas were scarcer and more expensive than dry beans.

Fodder.—Lucerne and especially oats were scarce, and the small quantities realized, without exception, the maximum price. Good supplies of teff, which were of poor to medium quality, were disposed of at satisfactory prices. Sweet-grass and green barley were also well represented and satisfactory prices were realized.

Eggs and Poultry.—Good quantities of eggs were offered, and were disposed of at favourable prices. Good quantities of poultry were also disposed of at satisfactory prices.

Index of Prices paid for Certain Farming Requisites.

This index, which appears elsewhere in this issue, indicates that the prices of agricultural implements, fertilizers, fuel, bags and dipping and spraying material remained unchanged for the quarter ended 31 July in comparison with the previous quarter ended 30 April 1947. The index for fencing material on the other hand, increased from 224 to 230 as a result of an increase in the price of fencing wire.

The index for building material increased from 186 to 189 as a result of an increase in the price of cement.

Feeds.—In order to make this index more representative, its composition has been extended in order to include the following feedstuffs:—Teff, dairy meal, laying mash and pig meal. The composition of this group is now as follows:—Mealies, oats, lucerne, teff, dairy meal, laying mash, pig meal, bone-meal and salt. This new index differs slightly, however, from the previous one. The index increased from 171 for the previous quarter to 173 for July 1947 as a result of an increase in the consumer's prices of mealies, oats and teff.

Agricultural Conditions in the Union During July, 1947.

Weather Conditions.—Except for good showers in the south-eastern Cape Province, the Transkei and the eastern Orange Free State and fairly good showers in the western and south-western Cape Province, the country generally had little rain during the month. The cold and snow in some areas caused damage to winter cereal crops.

Crops.—On the whole, summer cereal crops were very satisfactory. In general, the prospects for winter cereal crops also appear to be promising, but the crops urgently required rain.

Stock and Pastures.—Although the condition of stock and pastures was still generally satisfactory, it began to deteriorate in certain areas as a result of the drought and cold weather. Except for lumpy skin disease in the western and south-western Cape Province, the Transkei and Natal, and for nagana in Natal, stock diseases were quiet. In the Karoo baboons caused losses to small stock.

The Marketing of Eggs.

As stated in a previous issue (See Crops and Markets of August 1947) the egg purchasing scheme of the Government will again operate during the present season. The Director of Food Supplies and Distribution will, with a view to export, purchase only grade I large eggs at 1s. 9d. per dozen.

Although no data in regard to the production of eggs are available, it is obvious from the sales of eggs by egg circles and wholesalers that the production of eggs has increased since 1944/45. Due to the improvement in the feeds position a further expansion in the production of eggs is expected during the present season (1947/48).

In order to dispose of the surplus economically, negotiations were conducted with the British Ministry of Food, and a contract was concluded whereby the British Government undertakes to buy 50,000 cases (of 30 dozen eggs each) during the present season at the price of 23s. per long hundred (10 dozen) for first grade large eggs free-on-board Union ports.

This represents a price of 2s. 3.6d. per dozen. After various export charges (case at 7s. 6d., railage at 1s., storage, handling and other minor cost items at 2s. 6d.—a total of 11s. per case or 4.4d. per dozen) have been deducted, the price will be 1s. 11.2d. per dozen.

A similar contract for the supply of 100,000 cases of eggs during the 1948/49 season at the same price was also concluded with the British Ministry of Food.

Maximum Prices of Eggs.

The maximum wholesale and retail prices of eggs in controlled areas, as fixed on 11 July 1947, were decreased by 6d. per dozen for all grades as from 18 July 1947.

Prices are now as follows:

Description of Eggs.		Maximum Price per dozen.	
		Wholesale.	Retail.
		s. d.	s. d.
GRADE I	(a) Large.....	2 0	2 3
	(b) Medium.....	1 10	2 1
	(c) Small.....	1 8	1 11
GRADE II	(a) Large.....	1 10	2 1
	(b) Medium.....	1 8	1 11
	(c) Small.....	1 6	1 9
GRADE III	Mixed.....	1 7	1 7

See *Government Gazette Extraordinary* of 18 July, 1947.

The maximum prices of eggs in the uncontrolled areas has been fixed at 2s. per dozen. See *Government Gazette Extraordinary* of 18 July, 1947.

The maximum prices of chilled eggs as fixed on 17 January 1947, were discontinued as from 1 August, 1947. See *Government Gazette Extraordinary* of 1 August, 1947.

Index of Prices of Field Crops and Pastoral Products.

The above index, which appears elsewhere in this issue, decreased from 203 during the previous month to 200 in July 1947.

The most important changes occurred in the following groups.

(a) "Hay" increased from 169 to 184 due to an increase in the prices of lucerne and teff.

(b) "Other Field Crops", i.e. potatoes, onions, sweet potatoes and dry beans, show an increase from 213 to 216 as a result of the increase in the prices of potatoes and particularly of onions.

(c) "Dairy Products" increased from 247 to 261 due to the increase of the winter premium on butterfat and cheesemilk and the increase in the producer's price of condensing milk.

(d) "Slaughter Stock" increased from 186 to 191 as a result of the increase in the seasonal prices of slaughter cattle in the controlled areas.

(e) "Poultry and Poultry Products" show a decrease from 291 during the previous month to 207 in June 1947 as a result of a sharp decrease in the prices of eggs.

The Marketing of Potatoes.

From the middle of July 1945 compulsory grading came into force on the nine controlled markets of the Union and potatoes ceased being marketed under the National Mark Scheme which is voluntary. The nine markets concerned are Johannesburg, Cape Town, Pretoria, Durban, Bloemfontein Pietermaritzburg, East London, Port Elizabeth and Kimberley.

In the following table the total supply of potatoes on the nine markets and the total quantities of each grade are given separately as from August 1945 to July 1946.

TABLE.

1945	Grade I.	Grade II.	Grade III.	Total.	Percentage.		
					Grade I.	Grade II.	Grade III.
August.....	21,359	40,973	72,545	134,877	16	30	54
September...	15,770	14,805	36,980	67,555	23	22	55
October.....	60,193	6,253	20,539	86,985	69	7	24
November...	46,669	21,809	17,195	85,673	54	26	20
December....	49,374	24,439	24,013	97,826	50	25	25
1946—							
January.....	52,158	36,801	44,378	133,337	39	28	33
February....	67,375	29,075	61,384	157,834	43	18	39
March.....	65,748	31,167	53,609	150,524	44	21	35
April.....	65,967	39,288	64,983	170,228	39	23	38
May.....	69,492	50,846	76,560	196,898	35	26	39
June.....	59,012	37,594	68,363	164,969	36	23	41
July.....	69,753	34,616	86,401	190,770	37	18	45
August.....	51,240	27,165	73,371	151,776	34	18	48
September...	51,275	19,487	53,178	123,940	41	16	43
October.....	84,686	19,155	50,812	154,653	55	12	33
November...	62,611	22,925	43,007	128,543	49	18	33
December....	66,148	21,508	35,110	122,766	54	18	28
1947—							
January.....	98,067	40,258	56,234	194,559	51	21	28
February....	85,440	33,447	45,510	164,397	52	20	28
March.....	105,257	28,809	45,622	179,688	59	16	25
April.....	118,219	42,868	56,374	217,461	54	20	26
May.....	75,857	32,153	31,584	139,594	54	23	23
June.....	62,521	31,161	33,680	127,362	49	25	26
July.....	96,573	45,599	55,851	198,023	49	23	28

CROPS AND MARKETS.

From the above table it is apparent that the largest quantities of potatoes are marketed during the first half of the year till about August. This is the period when the crop of summer potatoes, which is by far the most important, is marketed.

The largest quantities of grade 3 potatoes reach the market during the latter part of the season, namely from June to September. The reason for this is that the summer potatoes have by then been left in the soil for such a long time that the quality is affected. From September supplies of winter potatoes begin to reach the markets. During the past season supplies, due to the good summer crop especially during the first four months of the year, were extraordinarily large and prices as a result decreased sharply as shown in the table of prices appearing elsewhere.

During May and June there was a sharp decline in supplies, mainly because during these two months farmers were busy reaping the maize crop and because the lifting of potatoes was postponed until July, with a view to higher prices. Prices improved during these months, and during July supplies were as a result again exceptionally heavy so that prices on some markets again experienced a decrease.

It is noteworthy that in 1943, when even larger supplies reached the markets, prices decreased less than during the past season. It seems that, together with the large supply of this year's summer potatoes, a decrease in the demand must also have occurred. During 1943 the total supply of eight municipal markets (excluding Kimberley) for the months January to July was 1,414,917 bags (150 lb.). Prices however, for best grades (National Mark) on the Johannesburg Market were never less than 10s. per bag, during these periods. For the corresponding period during 1947, altogether 1,204,855 bags were offered on the same eight municipal markets, whilst the prices for grade I potatoes on the Johannesburg market decreased to an average of 9s. 6d. per bag for March, 1947.

Index of Prices Paid for Farming Requisites.

Year and Month.	Imple-ments.	Ferti-lizers.	Fuel.	Bags.	Feeds.	Fencing Material.	Dips and Sprays.	Building Material.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Basis—								
1936-38...	100	100	100	100	100	100	100	100
1942.....	123	157	140	206	139	229	117	168
1943.....	144	171	154	237	154	239	127	179
1944.....	161	184	156	307	155	240	134	184
1945—								
January...	159	204	156	310	161	225	136	181
April.....	159	204	156	311	164	224	136	181
July.....	159	204	156	321	172	225	135	180
October...	159	204	146	321	169	225	135	179
1946—								
January...	155	204	146	314	172	218	135	174
April.....	152	204	146	304	166	213	134	174
July.....	152	199	130	308	168	214	134	176
October....	153	199	131	308	164	215	134	177
1947—								
January...	163	199	131	325	163	216	134	184
April.....	164	199	123	325	171	224	137	186
July.....(j)	164	199	123	325	173	230	137	189

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

- (a) Ploughs, planters, seed-drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, shares, land sides, mouldboards, mowers, knives, pitmans, guards.
- (b) Superphosphate, ammonium sulphate, muriate of potash.
- (c) Petrol, power paraffin, crude oil, grease, lubricating oil.
- (d) Woolpacks, grain bags, sail twine, binder twine.
- (e) Mealies, oats, lucerne, teff, dairy meal, laying mash, pig meal, bonemeal, salt.
- (f) Fencing wire, standards, baling wire.
- (g) Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.
- (h) Corrugated iron, deals, cement, lime, flooring boards.
- (j) Preliminary.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season 1 July to 30 June.	Johannesburg.			Durban.		Pretoria.	Cape Town.	
	Trans- vaal N.M. all classes. Grade I.	Transvaal.		Natal Ordinary No. I.	O.F.S. Ordinary No. 1.	Trans- vaal N.M. classes. Grade I.	Cape Ordinary No. I.	Trans- vaal Ordinary No. I.
		Ordinary No. 1.	Ordinary No. II.					
1938-39....	s. d. 8 5	s. d. 6 9	s. d. 6 2	s. d. 8 10	s. d. 8 4	s. d. 8 5	s. d. 8 2	s. d. 8 6
1939-40....	8 4	6 7	6 7	9 10	8 9	8 3	9 0	10 2
1940-41....	18 4	14 2	13 4	16 10	17 1	15 10	15 7	17 0
1941-42....	24 8	19 3	18 7	23 3	21 0	25 1	20 1	22 7
1942-43....	16 4	13 7	12 6	16 9	17 8	16 6	15 0	17 8
1943-44....	28 10	17 1	15 0	23 6	19 4	20 5	21 2	22 10
1944-45....	25 6	25 1	19 2	25 5	24 4	25 4	25 4	28 1
(a)	Grade I.	Grade II.	Grade III.	Grade I, all classes.	Grade I, all classes.	Grade I.	Grade I, all classes.	Grade I, all classes.
1945-46....	30 11	24 11	15 9	28 9	29 8	29 6	30 11	30 7
1946—								
January..	34 8	30 9	19 5	34 1	—	35 8	31 6	—
February..	25 7	19 5	11 3	28 2	30 6	24 2	35 6	33 3
March....	23 9	18 3	11 7	26 3	25 11	24 0	29 8	29 5
April.....	27 0	22 2	13 8	28 4	36 8	27 3	31 1	32 6
May.....	27 3	21 5	13 1	28 2	29 1	25 2	27 1	27 11
June.....	28 0	23 3	15 8	25 8	25 9	29 0	30 8	30 4
July.....	28 8	23 11	16 2	31 11	32 0	31 3	31 5	32 10
August....	31 9	26 1	16 0	33 6	32 5	33 2	33 2	34 6
September	35 8	28 0	17 7	35 9	36 6	35 6	33 11	34 6
October...	36 3	29 2	20 11	36 10	37 2	33 11	34 6	—
November	26 10	23 5	16 0	33 9	33 10	24 8	28 11	—
December	18 11	16 0	12 1	26 6	29 9	19 6	19 4	—
1947—								
January..	12 4	9 0	6 5	15 1	—	11 8	15 6	15 1
February..	10 1	7 9	5 9	12 7	12 11	9 9	15 5	14 9
March....	9 6	7 2	5 10	14 0	9 10	9 7	12 9	13 5
April.....	11 5	8 2	6 3	12 10	11 7	11 10	15 3	13 11
May.....	12 8	9 10	7 4	17 8	17 6	12 8	18 0	14 7
June.....	17 4	13 4	9 5	18 7	16 11	17 5	21 11	17 8
July.....	16 11	12 5	7 11	20 1	19 4	16 1	22 11	18 0

(a) As from July 1945 compulsory grading was introduced on the nine controlled markets of the Union and the National Mark grades were abolished.

CROPS AND MARKETS.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.		Johannesburg. Table.		
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.			
1938-39.....	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40.....	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1940-41.....	6 3	9 10	7 8	9 11	9 8	10 5	5 7	5 9	5 0
1941-42.....	12 5	12 3	9 10	11 11	11 2	12 7	7 8	6 4	5 5
1942-43.....	10 5	18 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1943-44.....	18 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1944-45.....	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1945-46.....	14 3	18 5	15 0	18 1	18 8	19 5	17 3	15 1	16 3
1946-47.....	12 4	14 11	12 9	15 3	14 9	15 7	14 11	13 5	14 7
1946-47.....	21 0	19 0	17 4	19 3	23 2	20 0	16 3	14 6	16 11
1946—									
January.....	12 0	12 1	9 7	—	11 7	18 0	17 1	15 6	17 3
February.....	12 8	18 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March.....	11 4	12 4	9 9	12 10	12 9	18 5	18 5	14 8	14 6
April.....	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May.....	13 6	18 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June.....	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July.....	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August.....	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September.....	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October.....	24 9	28 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December.....	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1947—									
January.....	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 8
February.....	14 8	14 5	11 9	13 7	16 1	17 6	16 11	7 6	18 11
March.....	17 6	18 7	14 3	20 3	13 4	17 8	15 6	13 4	16 1
April.....	20 7	22 2	17 10	22 3	24 11	24 4	12 7	8 4	10 9
May.....	22 4	24 11	20 11	26 2	27 5	24 1	10 1	8 6	11 7
June.....	26 2	26 9	23 3	26 9	26 4	27 2	9 9	7 5	11 5
July.....	31 5	31 5	25 2	30 6	29 10	34 5	8 6	7 10	10 9

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johannesburg (a) 100 lb.	KAFFIROORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.O.R. producers' stations.		Johannesburg (a).		
	Cape.	Transvaal.			K1.	K2.	Speckled Sugar.	Cow-peas.	Kidney.
1938-39.....	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40.....	2 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1940-41.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1941-42.....	4 2	3 5	4 3	3 3	15 6	17 0	30 0	18 8	27 11
1942-43.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1943-44.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1944-45.....	6 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1945-46.....	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 4	70 6
1946-47.....	6 6	5 11	7 7	4 8	24 8	24 8	101 0	62 10	82 8
1946-47.....	5 11	5 7	7 5	4 3	45 9	45 9	78 11	42 9	61 9
1946—									
January.....	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February.....	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March.....	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	81 4	51 0	74 3
May.....	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June.....	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1947—									
January.....	5 10	5 11	7 5	3 8	48 9	48 9	61 4	33 11	51 4
February.....	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 3
March.....	6 3	5 10	7 5	3 11	40 8	40 8	47 1	35 1	49 3
April.....	7 1	6 10	7 8	4 7	38 4	38 4	55 7	42 3	56 1
May.....	6 8	7 6	7 9	4 6	33 5	33 5	50 8	38 2	50 0
June.....	6 9	6 9	8 3	4 7	33 0	33 0	50 4	41 2	49 0
July.....	7 4	7 1	6 9	5 1	30 5	30 5	45 9	33 7	43 9

(a) Municipal Market.

(b) Seasonal year for kaffircorn.
1 June-31 May.

Dry Beans, 1 April-31 March;

Lucerne and teff, 1 July-30 June.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1 July to 30 June.)	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Com- bined index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
WEIGHTS.	19	13	2	8	34	6	17	6	100
1936-39.....	92	109	96	89	79	102	106	94	98
1938-40.....	86	114	77	95	115	105	106	89	104
1940-41.....	108	120	106	156	102	108	110	103	109
1941-42.....	120	144	148	203	102	181	185	186	124
1942-43.....	160	167	144	159	122	147	168	167	147
1943-44.....	170	186	137	212	122	154	185	188	159
1944-45.....	183	186	160	231	122	177	179	184	164
1945-46.....	201	194	164	312	118	198	185	170	170
1946-47.....	241	209	149	232	169	205	192	204	198
1946—									
January.....	198	194	191	347	118	204	188	204	174
February.....	198	194	183	305	118	186	184	224	171
March.....	198	194	180	280	118	188	181	241	171
April.....	198	194	176	293	118	186	180	279	174
May.....	249	194	170	284	119	186	177	289	184
June.....	246	194	178	287	119	213	178	280	184
July.....	245	194	182	303	120	231	183	193	182
August.....	242	194	181	319	120	231	183	164	181
September.....	243	194	183	351	163	231	196	156	198
October.....	240	194	166	365	171	231	204	155	203
November.....	240	210	165	309	179	184	208	171	204
December.....	242	210	157	286	168	194	208	201	200
1947—									
January.....	242	210	144	174	178	194	200	238	202
February.....	240	210	127	157	187	194	191	248	203
March.....	240	210	154	188	189	194	182	281	203
April.....	239	210	176	169	190	194	179	283	205
May.....	225	210	166	187	192	194	183	318	206
June.....	225	210	169	218	174	247	186	291	203
July.....	224	210	184	216	175	261	191	207	200

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and tef hay.

(d) Potatoes, sweet potatoes,
onions and dried beans.
(e) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and
condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (a)		
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.
1938-39.....	s. d. 1 8	s. d. 2 3	s. d. 2 0	s. d. 1 9	s. d. 1 2	s. d. 3 8	s. d. 2 6	s. d. 6 1	s. d. 6 1
1940-41.....	1 11	2 9	1 5	2 8	2 4	5 9	4 11	13 4	13 4
1941-42.....	2 7	3 10	2 6	3 11	3 8	8 4	8 5	8 11	17 2
1942-43.....	3 1	4 8	3 0	3 3	2 10	8 9	5 1	8 9	13 2
1943-44.....	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944-45.....	3 7	5 1	4 1	4 9	4 1	5 5	8 8	9 11	19 10
1945-46.....	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1946-47.....	3 11	3 7	3 6	4 10	4 3	5 0	5 9	4 9	14 11
1946—									
January.....	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February.....	1 11	—	2 3	6 5	—	6 4	7 3	7 11	14 1
March.....	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.....	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May.....	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 8	18 8
June.....	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July.....	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
August.....	6 8	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.....	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December.....	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January.....	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
February.....	4 2	—	5 1	3 2	—	5 8	10 4	—	12 8
March.....	3 5	—	2 8	5 3	—	7 5	16 8	20 0	24 5
April.....	2 7	2 5	2 1	6 7	5 1	7 8	13 4	4 11	27 1
May.....	3 0	3 3	2 5	9 0	4 0	4 8	8 10	18 8	23 8
June.....	2 11	3 4	4 3	5 9	4 4	3 7	7 1	17 11	16 7
July.....	6 0	4 6	5 2	5 8	5 5	4 11	6 0	11 7	15 11

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

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[Photo on Cover: Bien Donné Experimental Farm, Groot Drakenstein, Cape.]

[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

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Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the Crops and Markets Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—*The Tariff for Classified Advertisements is:* 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:

- (1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
- (2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
- (3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
- (4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ... AFRICA

VOL. 22

OCTOBER 1947

No. 259

Editorial : ✓

The Improvement of our Indigenous Plants and animals.

IN the nation-wide effort which is at present being made to protect our soil against erosion and to reclaim the already damaged portions, the need for suitable types of plants and animals for this purpose is being increasingly appreciated. In our search for hardy types of plants which fulfil the various requirements, we are gradually forced to the conclusion that success in this direction is largely dependent on the greater utilization of indigenous types, whether they are used as vegetal cover on exposed soils, to bind soil on depleted lands and protect them against wind and water, or, by establishing themselves and spreading in silt to transform gullies into vleis.

It is, therefore, encouraging to observe that the one-time indifferent attitude towards our indigenous vegetation is to-day being superseded by a realization of the valuable rôle which it can and necessarily must fulfil in our struggle against soil erosion, with the result that it is no longer being ill-used.

These remarks also apply in no small degree to our indigenous types or farm animals which have been shamefully neglected in the past. It is an irrefutable fact that our indigenous types are not only exceptionally well adapted to conditions in this country but that they are also very amenable to improvement, as is evidenced by the results obtained with the development of one indigenous breed of cattle, viz. the Afrikaner.

In general the value of our unimproved indigenous stock and plants lies not so much in their present capacity for economical production, as in their capacity in the first instance, for performing pioneer services in the reclamation of depleted soil and veld under conditions under which other types are less likely to succeed.

Further, their value lies in the possession of characters on which, through improvement, a higher production capacity, accompanied by hardiness, can be built. In this connection, we think of the possibility of developing more effective types of plants for the abovementioned purposes by breeding and selection, or, in the case of animals, of the possible development of hardy beef and dairy breeds which can play a useful and constructive rôle not only in native areas, but also in areas where unfavourable climatic and environmental conditions prevail.

In the absence of a suitable improved indigenous type, recourse is often had to an imported type of plant or animal for use under conditions to which they are not suited. Such a policy must

necessarily result in great losses even if, in many cases, only of an indirect nature, as e.g. reduced fertility, poor calf crops and lack of vigour in the animals.

In order to surmount this problem and because it is realized that the soil reclamation campaign cannot be successfully carried out without the assistance of indigenous material, the Department is at present taking steps to protect and improve our indigenous types which could possibly fulfil the necessary requirements.

A start has already been made with the "Drakensberger" (on which a report appears in this issue) and an interdepartmental committee is soon to be appointed to make a survey of and report on other promising indigenous types which should be protected with a view to studying and improving the characters for the advancement of agriculture.

(J. A. van Rensburg, Division of Soil Conservation and Extension.)

Food makes the World Go Round.

A wise man once compared the prosperity and welfare of a country to a giant oak tree whose branches and leaves represent commerce and industries, and the roots, the agricultural industry. He said that if the roots are damaged, the leaves fall off, the branches die off and the tree eventually topples over. This is indeed an apt simile. The agricultural industry is the artery of South Africa. If it is severed, the country will bleed to death. It provides the food without which no human being could survive. Three times a day when meals are partaken of, the activities of the world virtually come to a standstill. Large, important conferences adjourn when it is time for a meal. Food is, and will always be the principal human need, and the agricultural industry satisfies this need. The value of our annual gold yield far surpasses that of our agricultural production, yet in the light of the above, it does not compare in importance. The agricultural industry stands supreme. It is the key industry on which other industries are dependent for their raw materials and provisions and no Government can afford to neglect agriculture or let it retrogress. Hence the fact that the Government has always done everything in its power to encourage and stimulate the agricultural industry, and will continue to do so.

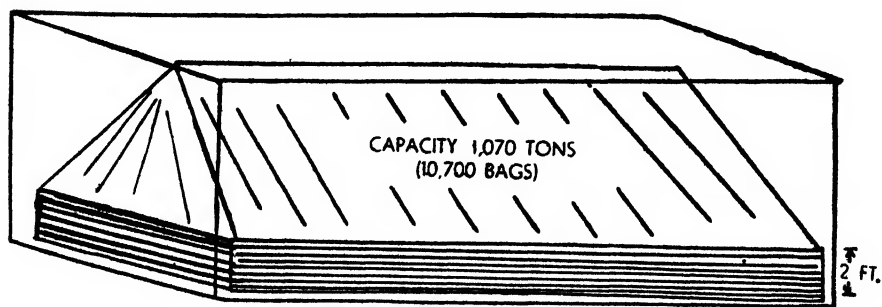
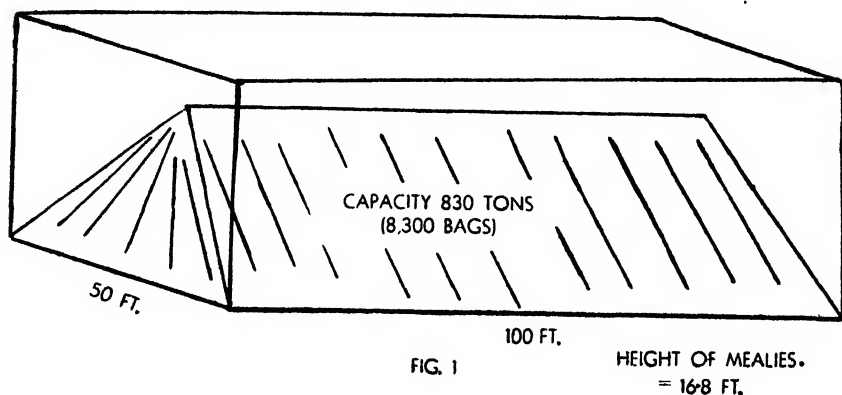
During the past quarter of a century this industry with all its ramifications has made amazing progress; yet there is still much room for improvement, and the task of effecting this improvement devolves on the farmers themselves. By co-operating and standing together they will be able to accomplish much more than lies within the power of any Government.

(G. J. Bosman, Principal, Potchefstroom College of Agriculture.)

Emergency Storage of Grain.

Dr. G. M. Dreosti, R. J. Nachenius and L. M. Bloch, Dehydration and Cold Storage Research Laboratory, Capetown.

IN view of the general scarcity of bags, the following suggestions for increasing the capacity of store-rooms in order to cope with grain-in-bulk will undoubtedly be useful on many farms as well as in co-operative stores. The method proposed is applicable to stores whose walls cannot withstand the pressure of bulk grain (maize, wheat, etc.) and is capable of rapid application with available building materials at very low cost.



Take, for example, a storage shed 100 ft. long, 50 ft. wide and 18 ft. high. If maize were heaped on the floor at its natural angle of repose (i.e. 35°) the capacity of such a store would be approximately 830 tons, equal to 8,300 bags (see Fig. 1). But if a wall 2 ft. high be built along the sides of the shed, and the maize heaped up to its natural angle of repose, then the capacity of such a store would be increased to approximately 1,070 tons (equal to 10,700 bags), resulting in an increase of 240 tons, i.e. 2,400 bags, or 29 per cent. (see Fig. 2). If the walls of the shed were strong

enough to withstand the full pressure, then the filling of the whole shed to a depth of the full 18 ft. would raise its capacity to 2,250 tons of maize in bulk.

Construction of the 2-Foot Wall.

Sheets of corrugated iron, 11 ft. in length, are supported by wooden poles, 3 inches in diameter. These poles are spaced 5 ft. apart, allowing the corrugated iron sheets to overlap one foot at every second pole. These poles must be firmly fixed in the ground—at least 2 ft. in earthen floors—either by driving them in or by making holes with a screw earth borer. Even with cement floors care should be taken that the poles are firmly fixed.

The sheets of corrugated iron must be held in position by driving 4-inch nails into the poles at the upper end of the sheets, as shown in Fig. 4. Thus the corrugated iron is not damaged and can later be used for other purposes. Once the bin so formed has been filled with grain, the sheets will be firmly held in position against the poles by the grain. To prevent leakage at the corners, a sheet of corrugated iron, 2 ft. by 2 ft., can be bent to a right angle and inserted as shown in Fig. 5. This sheet-iron wall should be about 1 ft. from the walls of the shed. In cases where the walls of the shed are made of wire netting, the grain-in-bulk should be protected against wind and rain, e.g. by means of taupalins.

Materials Required

For the construction of a corrugated iron wall of 100 ft. by 50 ft., the following quantities of material would be required at the approximate costs stated:—

(a) Corrugated iron: 31 sheets of 11 ft. (2 ft. wide) ±£20.

(b) Wooden poles: 64 of 6 ft. long and 3 in. diam. ±£1. 12s.

(c) Nails (4 inch.): One gross.

Hence, for the storage of 2,400 bags of maize, the total cost of the project, including cost of labour should not exceed £40, i.e. $\frac{40 \times 240}{2,400} = 4d.$ per bag.

N.B.—In the event of a 4-ft. wall being required, then 13-ft. sheets of corrugated iron should be used (2 ft. 3 in. wide) together with poles of $4\frac{1}{2}$ -inch diameter and spaced 4 ft. apart.

Bag-stacked Walls for Large-scale Storage.

Where the size of the crop is such that the available stores must be used to their full capacity, the first consideration is the strengthening of the walls in such a manner that they will be strong enough to withstand the pressure of the grain-in-bulk.

The cheapest and quickest method seems to be the construction of inner walls with bags of maize so as to form "bins" into which the bulk of the maize can be poured.

In order to determine the dimensions of walls required for different heights of stacked bags, as also the direction and manner of stacking, tests were first conducted, since it must be borne in mind that a wall of stacked bags may fail, through—

(a) sliding outwards over the floor or over the bags in the stack;

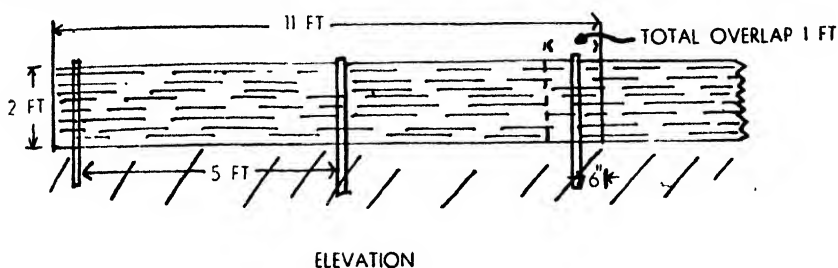
(b) toppling over; and

(c) internal collapse of the wall, e.g. due to bad construction, or to escaping contents as a result of rat damage or bursting of a weak bag.

EMERGENCY STORAGE OF GRAIN.

Exploitation of the Angle of Repose.

After a series of tests with technical calculations and measurements to determinate the best angle and thickness and height of the walls for safe construction, a practical method of stacking is suggested for the construction of low vertical-faced walls, after which the stack of maize-in-bulk is built up right over the walls, as shown in Fig. 6,



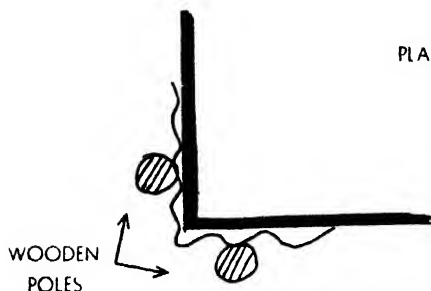
ELEVATION

FIG. 3



METHOD OF ATTACHING
CORRUGATED IRON TO POLES

FIG. 4



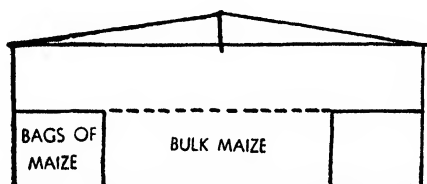
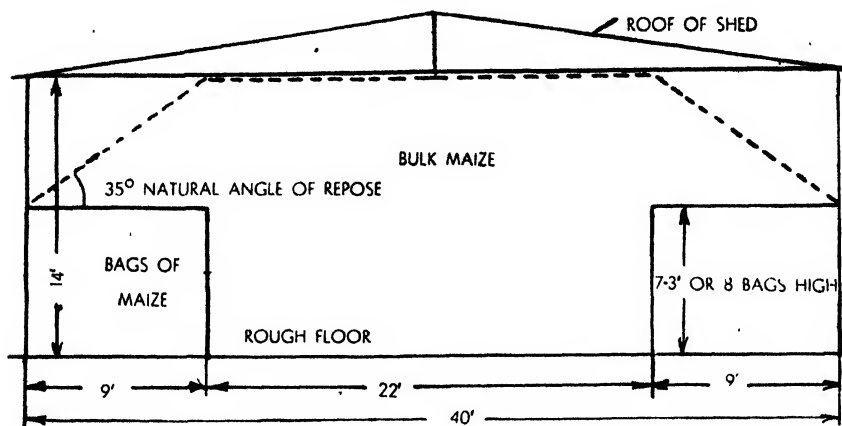
PLAN VIEW OF CORNER PIECE

FIG. 5

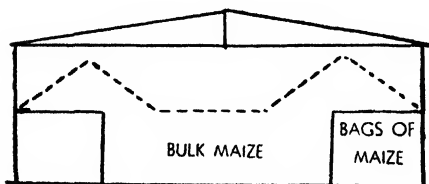
following the three operations indicated. If the bag-walls were built to a height of 8 bags, with a nominal thickness of 9 ft., in a store of 40 ft. by 100 ft., with a partition wall across the middle of the length to form two bins, and the bulk maize be filled to a height of 14 ft. in two separate stacks overlapping all the walls (see third operation), the total maize capacity of the store would be 1,094 tons, or 92.5 per cent. of its full capacity for bagged maize. The bags

forming the walls would contain approximately 377 tons of maize, or 34.5 per cent. of the total. These low vertical-faced walls would be 50 per cent. stronger than the minimum necessary to resist

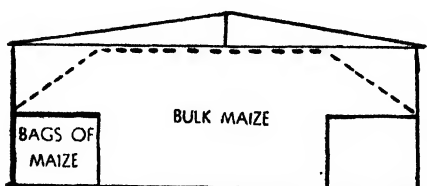
FIG. 6 EXPLOITATION OF ANGLE OF REPOSE



FIRST OPERATION
(STACK BAGS OF MAIZE AND FILL BIN WITH BULK MAIZE AS SHOWN)



SECOND OPERATION
(THROW BULK MAIZE IN A HEAP ON TOP OF BAGS OF MAIZE)



THIRD OPERATION
(COMPLETE BULK MAIZE AS SHOWN)

failure. This method is therefore well worth applying in view of the considerable saving in bags. A trial of this method, with the co-operation of the Oostelike Transvaalse Koöperasie Beperk, indicated its safety; but with the mechanical elevator used it was difficult to pour the maize to a natural angle of more than 25°. Investigations have shown that in order to attain the full angle of 35° it is necessary to pour the maize in such a way that it drops on to the heap from a height of less than 2 ft. above the heap.

Function of Seed-Maize Growers' Associations.

J. J. du Toit, College of Agriculture, Potchefstroom.

WITHOUT a doubt, the use of good maize seed with a guaranteed viability will contribute considerably towards ensuring a higher maize yield per morgen. By good seed is meant—

- (a) seed of suitable varieties, adapted to the specific area and producing a high yield per morgen, even under comparatively unfavourable conditions;
- (b) seed free from disease-infected and other undesirable seeds, e.g. yellow seed in white maize;
- (c) fairly uniformly graded seed, so that some seeds will not be broken by the planter plates; and
- (d) seed with a viability of at least 95 per cent.

The thought which will immediately occur to every progressive farmer, is where such desirable seed can be obtained. Most farmers are not in a position to produce such seed on their own devices. They do not, for example, see their way clear to carry out experiments themselves to determine which maize varieties yield the best results in their area, and they consider it too much trouble to apply seed selection on the land every year in order to produce adapted varieties in the course of time. Many farmers are even unable to grade their own seed with a suitable grader.

All in all, it seems that the breeding and propagation of good seed is a specialized undertaking, falling outside the scope of most farmers.

Nevertheless, the necessity for making seed of a good quality available in some way, is fully realised, as has been proved, among other things, by the numerous applications in connection with seed maize received daily at the College of Agriculture. Unfortunately, the Colleges of Agriculture are unable to supply these needs. The necessary facilities for the large-scale propagation of maize are lacking. Moreover, it would be unfair for the Government to compete with private seed growers. The Government could, however, determine which maize varieties will yield the best results. It has been established, for instance, that the following white maize varieties will yield very good crops in most parts of the Transvaal, viz., the Improved Potchefstroom Pearl (growing period 135 to 140 days), the Improved Anveld (115-120 days) and Early King (125-130 days). In some parts the latter variety is also known as "Engelsman." Of the varieties mentioned, the former will undoubtedly be the most suitable for plantings during October and November, while the Improved Anveld would be more suitable for plantings until Christmas time.

Value of Seed Growers' Associations.

Since the Colleges of Agriculture are unable to make adequate supplies of these and other popular maize varieties available, and since seed offered by individual growers and seedsmen is often unreliable, the indicated way out is to form seed growers' associations producing certified seed under Government control at a reasonable price. In the western Transvaal, two such seed maize growers' associations have already been established, the members of which

were originally provided with specially bred seed of the abovementioned maize varieties by the Potchefstroom College of Agriculture. An Inspector of the Division of Soil Conservation and Extension sees to it that members cultivate each maize variety at least half a mile from any other maize variety and that the maize is properly cultivated and harvested in accordance with the regulations of the Department of Agriculture. The seed is properly graded by means of a central grader.

Testing and Certifying of Seed.

Such seed is also tested for viability and the presence of undesirable rotten and yellow seed. No seed containing more than 3 per cent. of defective seeds or having a viability of less than 95 per cent. is certified. In the case of white maize, not more than 10 yellow seeds are allowed per bag (200 lb.) By defective seeds is meant seeds which are mouldy, sprouted, broken or damaged by insects, mice, frost or drought or discoloured by disintegration. Angular or round seeds which are undamaged and healthy, however, are not regarded as being defective or undesirable in flat varieties unless they contain more than 10 per cent. of such seeds.

At the final inspection a certificate is sewn into every approved bag, and sealed. Buyers of certified seed can, therefore, rely on the seed obtained from seed maize growers' associations.

Emergency Storage of Grain:—

[Continued from page 780.]

Precautionary Measures.

In the application of this method, certain precautions should be applied:—

(1) Cement floors should be roughened in order to prevent the bottom layer of bags from sliding over the floor. Otherwise wooden battens or concrete rims can be fixed around the walls.

(2) The walls should be properly stacked, with the inner face either vertical or *slightly* overhanging *inwards*.

(3) The walls should be properly bonded, by overlapping the bags, with the main object of providing the maximum number of overlaps *across* the walls, i.e. the bags in any one layer overlapping to the greatest extent the gaps running along the length of the wall between bags in the lower layer.

(4) When surcharging such walls, it is absolutely essential, after filling the bin level with the top of the walls of bagged maize (Fig. 6, first operation), to load the surcharge *on the walls* (second operation) *before* adding more maize to the top of the bulk maize, i.e. to surcharge the filled bins from the outer edges of the walls inwards to the middle of the bins.

(5) Loading of the grain in the final stage of the third operation (Fig. 6) should be performed gently, in order to get as much grain as possible on to the heap, without premature "overflowing".

(6) It is obvious that proper equipment would be necessary for conveying bulk maize, and for this purpose two different types of portable elevators are being tried out in the laboratory.

The Drakensberger.

1.—“Uys Cattle”.

ACTING on instructions of the Honourable, the Minister of Agriculture, a Committee consisting of Messrs. J. A. van Rensburg (Chairman), E. Adler, Animal Husbandry Officer of the Division of Soil Conservation and Extension, and H. P. D. van Wyk of the Division of Agricultural Education and Research, investigated the history, i.e. the origin and development of the so-called “Uys” cattle as well as the lines followed in the breeding of this type in the process of its development; the present level of its

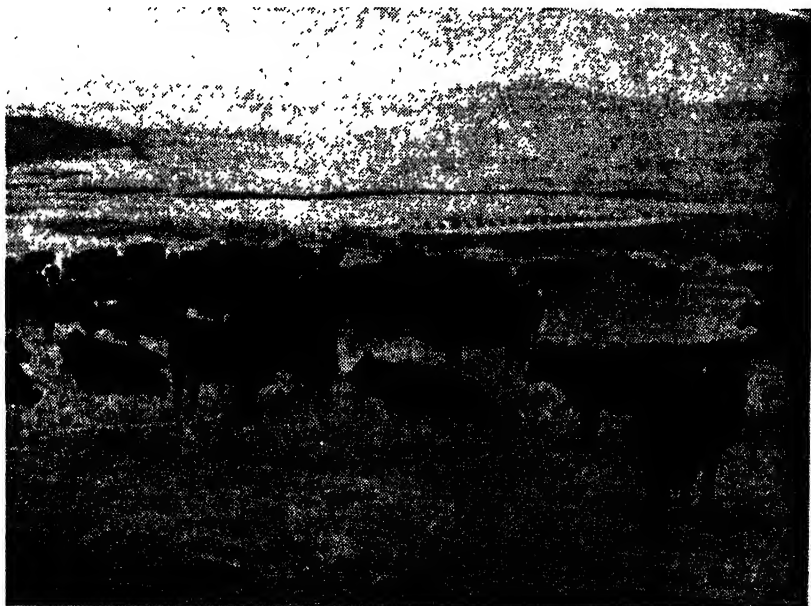


FIG.—A herd of Uys cattle.

development; the degree of prepotency and uniformity of this type in respect of certain characters with a view to determining whether a definite breed or type has as yet been established; the need for such a type in the livestock industry; the number and quality of animals available for further propagation, if desired; the desirability or otherwise of the approval of bulls of this type under the Livestock and Meat Industries Act (No. 48 of 1934); and finally, the procedure to be followed in the inspection of such bulls, should this course be decided upon.

Procedure.

In the course of its investigation the Committee interrogated 30 witnesses, mostly breeders of this type of animal, as well as officials conversant with the area where this breed is kept.

Since Uys cattle are not a recognized breed and no controlled experiments and observations have been carried out with them, the Committee had to rely mainly on evidence and on personal observation for an evaluation of the merits of this type of cattle. The evidence was given in a candid and convincing manner and

was characterised by the absence of sentiment and a desire to state facts accurately on the part of witnesses. The Committee felt justified therefore to accept the evidence, on the strength of its unanimity, as a basis for its investigation.

Origin and Development of the Uys breed.

On the inspection tour, kindly organized by Messrs. C. J. Uys and P. L. Moolman, Chairman and Secretary, respectively, of the Uys Cattle Breeders' Association, in collaboration with Mr. van der Horst, Extension Officer at Dundee, 22 breeders were visited and a total of 2,300 head of cattle inspected. Evidence was taken from all these breeders as well as from eight officials. The investigation was, however, considerably hampered by unfavourable weather conditions (rain and cold) which rendered some of the roads impassable and made it difficult, and in some cases impossible, to take photos and films.

As regards the *origin* and *history* of the Uys breed, the evidence obtained from various sources showed considerable similarity, and may be summarized as follows:—

A Voortrekker, Mr. Dirk Uys, known as "Swart" Dirk Uys, was the first to breed this type of black cattle by crossing a black bull having a white spot on the forehead, white hind legs and white switch, with two red heifers of the Afrikaner type. On the question



FIG. 2.—The home of Uys cattle—The Drakensberg region

of the origin of this bull and the heifers and as to how Swart Dirk Uys came by them, the evidence was somewhat divergent. According to some witnesses the bull was bought by Swart Dirk's father in the Orange Free State from a fellow Voortrekker, together with some oxen, to pull his waggon in the place of his stolen horses. Swart Dirk subsequently inherited this bull and later bought the two heifers on the sale of the late Gerrit Maritz.

According to another version the bull, which had been bred from a "Vaerlandsche Friesch", as well as the two red heifers, was presented to Swart Dirk's father by the Governor of the Cape

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on the occasion of the departure of the former from the Cape Province with the Great Trek. Be that as it may, practically all the witnesses are agreed that as far as is known, the bull was bred from parents known at the time as the "Vaerlandsche Friesch" and that the two red heifers were presumably of the Afrikaner type.

With these as foundation stock Swart Dirk Uys began breeding and later settled for a time in the Umkomaas Valley. From here he moved to Goedgenoeg in the Utrecht district, and thence to Twyfelfontein in the Wakkerstroom district, where he finally settled and concentrated on the development of his herd.

Line of Breeding.

Very little information is available on the lines of breeding followed in the initial stages. One thing seems certain however, namely, that after crossing the red heifers with the white-footed bull, Swart Dirk Uys never obtained bulls from outside sources but



FIG. 3.—An Uys bull.

always bred and used his own. The Committee, however, suspects that during his stay in the Umkomaas Valley, Swart Dirk acquired cows and/or heifers of the indigenous type (i.e. Zulu cattle) and in this way introduced blood of this type into his herd. The appearance of certain typical Zulu characters in a few individuals in the present herds would be difficult to account for otherwise, since, without exception, breeders assured the Committee that none of them ever introduced Zulu cattle blood into their herds, from either the female or the male side.

Swart Dirk Uys' herd increased rapidly and from time to time furnished foundation stock for his sons as and when they went farming on their own.

After his death, the herd was divided amongst his sons, Swart Cornelius Uys, Coenraad Uys, Swart Koos Uys and others. These sons had always obtained bulls from their father and later exchanged bulls amongst themselves.

The breeding of these cattle received a severe setback during the Anglo-Boer War, many of the herds being practically wiped out. Coenraad and Swart Koos Uys, however, somehow managed to retain their herds, the latter at Kromellenboog in the Wakkerstroom District.

After the war, breeders had to rely mainly on these two herds for building up their stock, while Coenraad and Koos Uys continued to exchange bulls amongst themselves. (It is interesting to note that this practice of exchanging bulls is still common amongst some breeders today.)

From this time onwards the Uys breed gradually increased and became established in the transitional areas on both sides of the Drakensberg mountains.

So far, there had been no established standard according to which the various breeders could breed and select. In the absence of a definite scale of points breeders then, as now, could not achieve the uniformity of conformation which is characteristic of established breeds. Natural selection, however, soon drew the attention of breeders to the value of certain characters eminently suited to the environment, which is characterized by its high altitude, intense cold, rapid fluctuations in temperature and mountainous topography. The breeding policy was accordingly directed at the evolution of an

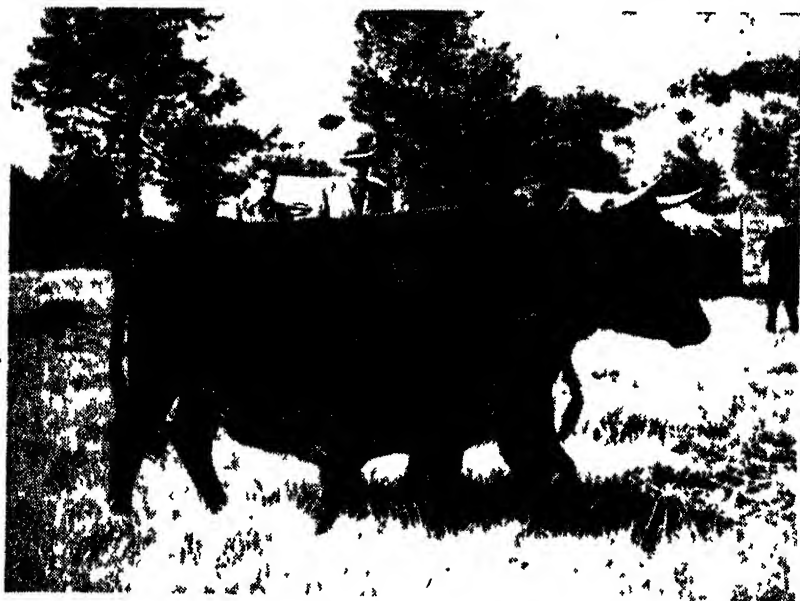


FIG 4—A typical Uys cow.

animal which could thrive under these circumstances, with the result that to-day characters, such as a black coat, a loose pliable dark skin, sturdy legs, strong hoofs and a broad muzzle are typical of these cattle.

Degree of Development Attained.

The purpose for which this type was developed was practically three-fold, viz. for milk and beef production and for draught purposes. From the earliest times, therefore, the development of these qualities as well as the retention of hardiness and resistance to cold, formed the basis of the breeding of Uys cattle.

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It was difficult to determine the level of development attained by Uys cattle before 1936, when bulls of this type were no longer approved under the Cattle Improvement Scheme, since it was impossible for breeders to maintain the standard of their herds without suitable bulls. Even herds outside the cattle improvement districts were indirectly affected, as the choice of bulls and breeding material became very limited. The result was that even these herds had at times to be served by inferior bulls.

From a few herds, and from individual animals of the older generation in others, however, a fairly good impression could be gained of the level of development reached before it was decided not to recognize this breed under the Cattle Improvement Act.

The Committee is of opinion that, although Uys cattle had never attained the uniformity characteristic of recognized breeds, it had definitely reached a level of development far above that of unimproved cattle types, and played an important rôle in the agricultural economy of the cold Drakensberg areas. It was evident that Uys cattle had developed a prepotency sufficient to ensure the transmission of those characters which are of economic importance despite some lack of uniformity in details of conformation and general appearance.

Claim to Recognition of the Uys breed.

In the absence of statistics the Committee was unable to determine the exact value and level of development in respect of certain characteristics. According to the unanimous evidence of farmers and stock buyers, however, the claim to recognition of the Uys breed is based on the following: (1) resistance to cold; (2) ability to maintain itself under local conditions (i.e. hardiness); (3) early maturity; (4) fertility; (5) vigour; (6) ability to produce beef and milk economically under unfavourable conditions; (7) longevity; (8) resistance to disease; and (9) value as a draught animal.

As regards No. (1), the Committee is prepared to accept that this type is very well adapted to that area and has no reason therefore to doubt that it does possess this quality. (2). It should be pointed out that the Uys breed is found in an area where merino sheep-farming is predominant. Very little or no winter provision is made for cattle, except a small allowance of sweetgrass hay for cows in milk. In most cases dry cattle have to manage exclusively on the veld. True, in many cases farmers trek to low-lying areas with their cattle for the winter months but even under these circumstances a less hardy animal would not be able to thrive on the same treatment. This ability of Uys cattle to utilize veld to such advantage, is regarded by the Committee as one of its most important attributes. Concerning points (3) and (4) the Committee had to rely mainly on the evidence. Several breeders, however, assured them that unless the bull calves were separated from the heifers in good time, heifers often calved under the age of two years.

No data could be obtained about the size of the calf crops. The Committee could find no reason however for not accepting the unanimous evidence that the cows calved regularly every year. In this connection it should be pointed out, that, in the opinion of the Committee the percentage of bulls in the herds is too low throughout and that this factor must necessarily have a detrimental effect on the calf crops. This phenomenon is perhaps due to the shortage of

suitable bulls as a result of rejections under the Cattle Improvement Act.

The evidence of a buyer of a large meat enterprise confirmed that of farmers, viz. that cattle of the Uys type are ready for the market at the age of four years off the veld. No one was able, however, to furnish weights of such animals. Further, he assured the Committee that after the winter, oxen of the Uys type were the first to show a good finish. Such oxen were usually bought off the veld in October, while oxen of other breeds reached a marketable condition much later.

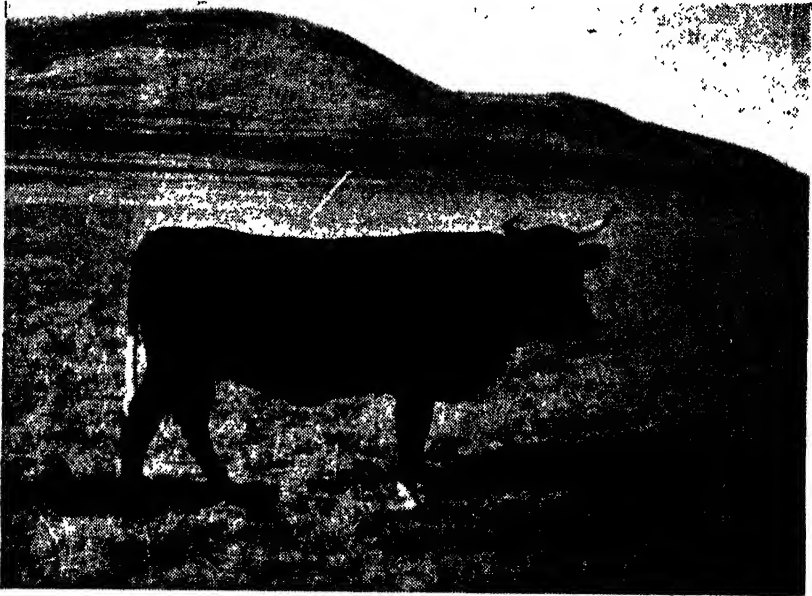


FIG. 5.—Uys animal with good beefing qualities. Note the white feet and switch which occasionally appear.

The size of mature animals is one of the striking features of this type of cattle. As expressed by one breeder in his description of the animal before 1936, "the cow is as large as the ox, and the ox as large as the cow". The three-fold purpose of the Uys breed was stressed by one and all. Although Uys cattle are not an out and out beef type, the slaughter and draught oxen shown to the Committee nevertheless bore testimony to their value in these two respects. As regards its milking qualities, it can only be said that it has the appearance of a dual-purpose breed and that there is no reason to doubt the evidence submitted in this respect. Witnesses recounted tales of exceptional cows yielding up to 32 bottles of milk after suckling their calves. They stressed the fact, however, that these were exceptions and that the average production of cows was much lower. It is claimed, nevertheless, that on the whole cows are milked off the veld during summer, and that the production is sufficient for the calves and for the farmer to derive a substantial income from his cream sales.

The low mortality among Uys cattle was praised by all. The Committee is inclined to accept this, since the animal is undoubtedly very well adapted to its environment and may therefore be expected to thrive. It should be pointed out, however, that this area is a very healthy one where normally the mortality among cattle is not

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high. In this connection the words of an old native is of interest. He said: „ In die ou dae al die bees hy was swart. Toe daar was baie bees. Toe hy kom die rooi bees, die wit bees, die bont bees. Nou mens sien net velle ”.

Recommendations.

From the above it is clear that the Uys breed can by no means be regarded as a scrub animal; on the contrary, it has already been improved to a considerable extent. The Committee feels, therefore, that the Uys breed complies with the basic requirements of the Cattle Improvement Act, viz. the elimination of scrub cattle and the improvement of potential breeding material, and accordingly, recommends that:—

- (1) The type at present known as Uys cattle be recognized for the purposes of the Cattle Improvement Act, since:—
 - (a) This cattle type has developed characters well adapted to the environmental conditions of the area where it has been evolved.
 - (b) By virtue of these characters it fulfills a useful function in the farming economy of that area.
 - (c) It has already been improved to some extent and is sufficiently prepotent to transmit its good qualities.
- (2) The inspection of bulls of this type be permitted under the Cattle Improvement Act. Since, however, a great deal of the material still available today leaves much to be desired, and is regarded as unsuitable for the breeding of bulls, it is proposed that:—
 - (a) *A Selection Committee, consisting of two experienced breeders, with a sound knowledge of Uys cattle and at least two officials well acquainted with this type be appointed for the purpose of selecting, from the bulls and cows of various breeders, foundation stock from which bulls may be bred for inspection.*
 - (b) *The birth of such bull calves be timeously reported and that any other rules necessary for the proper control of the breeding of bulls be complied with.*
 - (c) *This committee be instructed to draw up such rules and regulations in consultation with the “ Uys Cattle Breeders’ Association ”.*
 - (d) *The Committee, also in consultation with the “ Uys Cattle Breeders’ Association ”, revise the existing score card so that it may serve as a guide in the selection of foundation stock.*

The Committee feels that this is the only procedure whereby the future breeding of this type of cattle can be placed on a sound and rational basis, and the systematic elimination of inferior genotypical as well as phenotypical breeding material can be ensured. Without such restrictions bulls genotypically unsuitable for the improvement of Uys cattle, but conforming in other respects to the minimum requirements for approval, will inevitably be approved.

With the large proportion of inferior breeding material which is found in herds of this type today, the approval of such bulls will delay the realization of the ideal (viz. the attainment of the necessary uniformity and standard for recognition of the Uys type of cattle as a breed) for many generations, if not jeopardize its ultimate realization entirely.

The Committee would hesitate to recommend the inspection of bulls on any other basis, at this stage.

II.—“Kemp Cattle” and “Tintern Blacks”.

In the course of this investigation the Committee also inspected the herds of Messrs. R. Kemp of “Selbourne” and R. H. and J. S. Carter, of “Tintern” in the Estcourt District. The herds are respectively known as the “Kemp Cattle” and the “Tintern Blacks”.

Kemp Cattle.

The history of this type is as follows:—

Thirty-six years ago Mr. Kemp started farming with a herd of good Afrikaner-type cattle. They were, however, too slow maturing and yielded insufficient milk to his liking. He consequently decided to improve his herd by the



FIG. 6.—Kemp bulls are used in some Uys herds.

introduction of a pure-bred Friesland bull followed by an Afrikaner. After that he used only bulls from his own herd, except on one occasion when two other black bulls were used, one belonging to Mr. Carter of Tintern and the other to a Mr. Williams. During the past twenty years, however, he has used nothing but bulls of his own breeding.

At present his herd numbers 1,300, of which 600 are breeding stock. His animals were selected throughout on the basis of the following characters, viz:—

- (a) a uniform black colour, with a sleek, short coat;
- (b) constitution and size;
- (c) good beefing qualities;
- (d) ability to produce sufficient milk for the calves;
- (e) temperament; and
- (f) fertility.

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Mr. Kemp furnished the following additional information about his herd:—

The cows are milked for the first three to four months of their lactation. From an average number of 50 to 60 cows milked in this way his income from cream averages £60 per month. Cows in milk receive a light ration of lucerne hay produced on the farm. Slaughter oxen are usually sold at the age of four to five years, with an average dressed weight of 700 lb. The cows calve regularly and disease occurs but rarely in the herd.

Cattle of this type have always been the owner's sole source of income and from an original herd of 60 (large and small) he built up his herd to the number mentioned above, and purchased four farms from the income obtained from his cattle in the process. The general appearance may be described as a black Afrikaner type and made a very favourable impression on the Committee. It differs from the Uys type mainly in that it shows a resemblance to the Afrikaner and carries more beef than the Uys cattle.



FIG. 7.—Oxen from Uys cows and a Kemp bull.
Oxen such as these, from the same herd, were chosen from 23 teams to draw the Voortrekker wagon at the time of the Centenary.

In the opinion of the Committee this herd is an asset to the livestock industry and it is felt that the elimination of such herds would not be in the spirit of the Cattle Improvement Act.

Recommendations.

The Committee therefore recommends that bulls of this herd also be selected for use in stock improvement areas under the same conditions as those proposed for Uys cattle. The Committee has no objection to the use of material from this herd as foundation stock for the further improvement of the Uys type. This view does not leave out of account the differences between the two types, but it is felt that genetically these differences are not sufficiently important to justify the recognition of one type and not the other,

or the recognition of both as separate units. The reasons for this are that—

- (a) both types were evolved from an admixture of Friesland and indigenous blood;
- (b) the blood of the two types has been mixed to a considerable extent in the past, since for many years numerous breeders of Uys cattle have on occasion used bulls from the Kemp herd;
- (c) uniformity will be the set aim in the selection of foundation stock, and only cows and bulls conforming to the revised standard of perfection will be selected as foundation stock for the various herds;
- (d) the two types show a similarity in respect of those qualities which form the basis of their adaptability.

Tintern Blacks.

The Tintern Blacks originated from a herd of hardy cattle (including cattle looted from natives) which belonged to the grandfather of the present owners. When the herd was divided fifty



FIG. 8.—A Kemp bull.

years ago, one of the sons, i.e. their father, chose all the black cattle. He then used an Afrikaner type bull and after that only black bulls of his own breeding. About forty years ago an Afrikaner type bull was again used and from then on only black bulls bred from the herd. When the Committee visited this farm, the herd had already been moved to its winter grazing and only a few oxen and young cattle were available for inspection. With the scanty information at its disposal the Committee feels that it is not in a position to make any definite recommendations concerning this herd, but suggests that the selection committee proposed for the "Uys" cattle also carefully inspect this herd with a view to determining whether it contains any breeding material which, together with the "Uys" cattle and the Kemp herd, may contribute towards the building up of a new black indigenous breed.

Name of "Drakensberger".

Several breeders of the so called "Uys" cattle, as well as breeders of the types known as Kemp cattle, and Tintern Blacks, objected to the name Uys and requested that the name be changed to a more impersonal one. They contend that although the one type of black cattle originated from the herd of Swart Dirk Uys, other breeders also played an important part in its development and that the name "Uys cattle" is therefore no longer appropriate. They point out that it is an unusual procedure in any case to name a breed of cattle after a breeder, and feel that it will be in the future interest of the "breed" if a more suitable name could be found which would meet with general approval.



FIG. 9.—Typical Kemp cattle.

"The cow is as large as the ox, and the ox as large as the cow".

The Committee feels that this point of view deserves serious consideration, since the whole question of building up a new breed may suffer if certain breeders should refuse to co-operate on account of the name. In order to obviate this difficulty and to promote the development of the type as rapidly as possible by obtaining the whole-hearted co-operation of one and all, it is proposed that the name be changed to that of "Drakensberger". This name will at once indicate the habitat of the breed and in this way draw attention to its characteristic qualities.

III.—Recognition of Indigenous Cattle Breeds.

The extent to which Uys cattle are adapted to the environment in which they were developed and the useful rôle this type of animal can play in consequence, has once again drawn attention to the potential value of our indigenous breeding material. Although the terms of reference do not call for comment on this aspect, it is nevertheless felt that the recognition of the Uys cattle (should this be decided upon) would be nothing less than the recognition of

the useful function which an indigenous type of cattle can fulfil. The Committee therefore takes the liberty to submit the following views in this connection:—

- (1) The tendency of our farmers to practice cross-breeding is often nothing else than an endeavour to breed an animal better adapted than the existing pure breeds and serves as proof of the need that exists for breeds or types adapted to certain conditions and areas.
- (2) As against the one recognized indigenous cattle breed, the Afrikaner, 14 exotic breeds are used in cattle farming in our country—breeds developed under conditions entirely different from those obtaining over the major portion of our country. Although the great economic

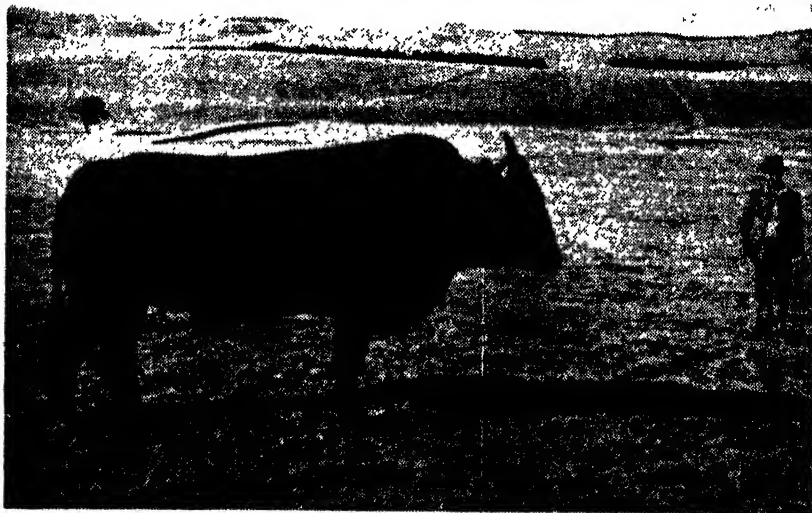


Fig. 10.—A Tintern Black ox.

value of these breeds is not underestimated, the Committee is nevertheless of the opinion that in our livestock industry this state of affairs accounts to a large extent for the degeneration, infertility, short production life, lack of vigour, disease and mortality found among our herds in certain cattle areas.

- (3) The large percentage of scrub animals in our herds may in many cases be directly ascribed to the poor adaption of the animal to its environment. With the natural limitations and the present level of farming development, it is quite possible that the level of development of an animal of the imported breeds may surpass that of its environment, and the greater this discrepancy, the more pronounced will be the phenomena referred to above.
- (4) While it should undoubtedly be the policy to raise the level of the environment, it cannot be lost sight of that in many cases such raising of the environmental level is subject to definite limitations as a result of unfavourable topography, rainfall, climate or soil conditions.

The Classing of Merino-Wool Skirtings.

J. C. de Klerk, Sheep and Wool Officer, College of Agriculture, Glen.

ACCORDING to the wool-classing standards of the National Wool Growers' Association, it is recommended that long light conditioned pieces and bellies $1\frac{1}{2}$ inches and longer, be baled together and marked CBP. In the case of large clips, however, the owner has the option, if he so desires, of keeping the long, light bellies of $1\frac{1}{2}$ inches and over separate from the long, light pieces of $1\frac{1}{2}$ inches and over, and marking the bales CB and CP, respectively.

From experience gained at our ports during the past few years, the writer has come to the conclusion that in the case of clips coming from mixed grass veld where farmers have to contend with steekgras, clover, etc., and where the fleeces have to be skirted comparatively severely for the removal of seed, it is unprofitable to bale the bellies and pieces together. Wool farmers are therefore strongly advised to keep these two types separate according to the above recommendations of the National Wool Growers' Association, and to observe the following amendments.

The purpose of classing is not only to comply with the requirements of the wool trade, but also to enable the producer to make the maximum profit. Many wool farmers have begun to realize that the grouping together of bellies and these long pieces which consist of seedy britch wool, side pieces and seedy neck pieces, is unprofitable, and the reason is not far to seek. These long pieces which are, in reality, fleece wool, are sold as a good topmaking type if not very seedy, and as inferior topmaking, if very seedy. According to a wool valuation chart of the British Wool Buying Commission, the basic price was 30½d. for good topmaking wools of B length ($2\frac{1}{4}$ inches and over) and 64/70s spinning count. For the corresponding inferior topmaking class, the basic price was 28½d., as against only 26½d. for the corresponding belly class. (These basic prices were applicable before the 5 per cent. seasonal decrease in 1945-46). It often happened, however, that a belly line which was very seedy, could not be sold as average bellies, but had to be sold in the carbonizing belly class where the price was still lower (23d. ex warehouse) and 4 per cent. was deducted from the clean yield for carbonizing costs.

Furthermore, bellies are usually heavier in condition than the corresponding fleece-wool classes. Where, therefore, these long pieces are baled with seedy bellies which, in addition, do not possess the colour, tensile strength, substance, and staple formation of the former, it means that all this wool will be sold as a carbonizing belly type, with a financial loss at the expense of the pieces.

The good wool classer will never put a large quantity of superior wool with a smaller quantity of inferior wool. In the case of wool (from steekgras veld) with a 12 months' growth the quantity of long pieces by far exceeds that of long bellies. To give the reader an idea of what the proportion can be, it may be mentioned that 471 lb. of long pieces of $2\frac{1}{4}$ inches and over and 100 lb. of long bellies of $1\frac{1}{2}$ inches and longer were obtained from 340 wethers with a wool growth of 12 months, recently shorn at the College of Agriculture, Glen, giving a ratio of 4.71:1. These figures speak for themselves. During the past season the price difference between long seedy pieces and long bellies was anything from 3d. to 6½d. per lb. This difference is strikingly illustrated in the following figures in respect

of consignments of wool from the College of Agriculture, Glen, during the past few years:—

1942 CBP i.e. long pieces and bellies together ...	13½d. per lb.
1943 CBP. i.e. long pieces and bellies together ...	13d. per lb.
1944 CBP i.e. long pieces and bellies together ...	12½d. per lb.
1945 2 bales of long bellies	10½d. per lb.
5 bales of long pieces	14½d. per lb.

Having regard to the fact that the basic price of wool for the 1945-46 season was reduced by 5 per cent., this price of 14½d. is noteworthy. The difference was all the more striking during the past season, viz. 1946-47, when these classes realized the following prices:

2 bales of long combing bellies; clean yield 43 per cent., price 14d. per lb.

5 bales of long seedy combing pieces; clean yield 53 per cent., price 20½d. per lb.

Today there are still farmers who sell clips with a comparatively large CBP line, and we would urge these farmers to keep these two types of wool separate. After 12 months' growth most of the wool is long, i.e. A and B lengths. When skirting these pieces, remove all wool of C lengths; keep the class with long pieces uniform, comprising lengths of 2½ inches and longer. If wool of C length is included, there is the risk that the longer wool will be placed in a lower class and as such fetch a lower price. Put the pieces of 1½ inches and less in the BP class; their addition will improve the class by making it longer and lighter, in consequence of which a better price will be obtained. If the classer does not want to make a starlot of the long combing bellies class, these may also be put with the BP class. At the College of Agriculture, Glen, it was found that for the past two seasons the difference in price between the two classes was too low (½d. per lb.) to justify their being kept apart. Thus, instead of being placed in two starlots, the wool may all be included in one large class.

As regards the mark to be put on this class of long pieces, there is as yet no finality, and it is a matter for the National Wool Growers' Association to take up especially as regards springbuck head clips. Some farmers definitely do not favour the mark CP, whereas such marks as SDY; BKN-FLCS; NKS; AM-S, AS-S, etc., are in general use. The mark which we would like to see adopted is BS-S—B to indicate that the wool is not less than 2½ inches (or A, if it is very long), S to indicate that all spinning counts up to 60/64s have been included (or BM-S if the wool is medium fine) and -S to indicate that the wool is seedy. For wool with 8/10 months' growth the appropriate mark will be CM-S.

This BM-S line is a very useful one since tender fleeces of which there are not sufficient to fill a bale or of which the classer does not wish to make a starlot, may profitably be included here. The same applies to single fleeces which, owing to lack of staple or crimp formation cannot be placed in the main classes, provided, of course that they are equally light in condition and of good colour.

Summary.

To sum up briefly: it may be pointed out that if the classer performs the work consistently, it does not mean that an extra line need be made. Where the farmer formerly had a CBP and a BP line, the classer now also has only two lines, viz. a line of seedy pieces of 2½ inches and longer (i.e. a BM-S line) and a second line in which all bellies thoroughly cleaned of LOX, are put with the shorter pieces and marked CBP, or, if they are not of an average length of 1½ inches, BP. In large clips where the farmer formerly

Sterility in Cattle due to Contagious Abortion.

Dr. G. C. van Drimmelen, Veterinary Research Officer,
Onderstepoort.

CONTAGIOUS abortion infection is often blamed primarily for any signs of general sterility in a herd. This is readily understandable in South Africa where few farmers employ thorough measures against the genital diseases of cattle, since these cause no mortality in existing stock. Delay in establishing the real source of sterility, however, often leads to severe losses. The rôle of contagious abortion in connection with the problem of infertility thus commends itself as a subject for review.

Sterility may be due to defects in the bull or the cows, and these may be of temporary or permanent nature.

Sterility in Bulls.

In the bull reduced fertility or partial sterility is often encountered. In such cases, the bull, even though moderately used on cows in good health, will settle only a small percentage of females served. This is in no way connected with any lack of sexual desire or ability to perform service, but is due to poor quality of the semen. This may be the result of improper feeding or inadequate shelter, or of inherited factors and infections. An infection of the testicles with *Brucella abortus* bacteria, which are the cause of the common contagious abortion, may produce this effect, as sterility will be total only when both testicles are fully infected.

In some cases a bull possessing good quality sperm may show a deficient sexual desire, as has been found in mature bulls when removed to a different herd in a different locality. Physical lesions which cause discomfort during service, may also be responsible. Such lesions usually affect the penis, prepuce or hindlegs, and the inflammation of the sheath produced by a recent infection with *Trichomonas foetus* may be mentioned as a possible cause of this. *Trichomonas* has been observed in South Africa, and, since it plays an important rôle in Kenya and has caused losses in Rhodesia, breeders should take steps to protect their herds against becoming infected.

Total permanent sterility of bulls is usually recognized with greater ease. If this has been brought about by an infective condition, the genital organs as a rule show visible changes, such as swelling and atrophy of the testicles.

Sterility in Cows.

Sterility in cows may occur in two different ways:—

In the one case, liberation of ova from the ovaries is prevented. Such animals may fail to come on heat or may be on heat almost continuously as nymphomaniacs. The condition is usually the result of infection of the ovaries and the infection is secondary after abortion or following calving.

Animals suffering from contagious abortion due to *Brucella abortus* are particularly prone to this trouble, as the disease tends to cause retention of the afterbirth with consequent delay in cleaning of the genital tract.

In the other case, the ova ripen regularly and heat occurs every third week. However, even after successful service by a good bull, the cow fails to hold, the reason being that either the sperm fails to reach the ovum or the embryo fails to become implanted in the uterus. This condition is due to changes in the mucous membrane of the genital tract, and in this connection the infections that follow abortion and retained afterbirth, play a most important rôle.

Briefly, therefore, it may be stated that contagious abortion may in some cases be directly responsible for infertility in the bull; but the lesions resulting from contagious abortion in cows are very often the cause of temporary or permanent total sterility. There are, however, numerous conditions due to causes such as inherited defects, delayed breeding, malnutrition, etc., which play a part in relation to fertility and it is important that stock-owners should institute a thorough investigation at every sign of reduced fertility, in order to establish the cause early. In this connection use can always be made of the contagious abortion test which is done free of charge. This test will show up the presence of Brucellosis which is responsible for the greatest amount of damage.

The Classing of Merino-Wool Skirtings:—

[Continued from page 796.]

had three lines, viz. CB, CP and BP, the classer now also has three, viz. a BM-S line of wool of $2\frac{1}{4}$ inches and longer (C length wool must strictly be removed here) again a BP line, and a CB line. The important thing to remember is that all long pieces must be baled separately and that long bellies must in no circumstances be mixed with them. If the classer does not wish to make starlots of the CB and BP classes, he can combine the two to form one big class. This practice is strongly recommended. As a guide for classers it may be mentioned that all lots of less than 3 bales are regarded as starlots in Port Elizabeth. The same applies to East London, although in the latter case, brokers can offer lots of one and two bales of good-quality wool for sale in the main sale-rooms. In Durban all lots of one bale are regarded as starlots and in Cape Town no starlots exist.

With regard to the desirability of creating starlots, it may be stated, for the guidance of classers, that from the financial point of view there is at present practically no difference in the prices obtained at the main sale-rooms and the starlot sale-rooms. Nevertheless, fewer starlots will benefit the trade since larger lots would enable the broker to sell more wool for the limited number of lots at each auction. It would be of great benefit to the buyers too, since they would be able to appraise more in a limited period and they would be prepared to pay a little more for larger lots to complete their orders. On no account, however, should regularity and uniformity be sacrificed for size of the class.

Inbreeding of Rapid Feather Growth in Poultry.

Its Great Economic Advantage.

P. J. Serfontein, Professional Officer (Poultry Research),
Potchefstroom College of Agriculture.

HIGH egg production is not the only economic aim in poultry breeding, but must go hand in hand with such factors as high hatchability, low mortality, longevity, etc., and progeny tests are therefore a pre-requisite for success. In South Africa the large-scale breeding of White Leghorns, Australorps and Rhode Island Reds along these lines, is being applied with great success. A number of formerly popular breeds have practically disappeared because they did not fulfil the desired economic requirements.

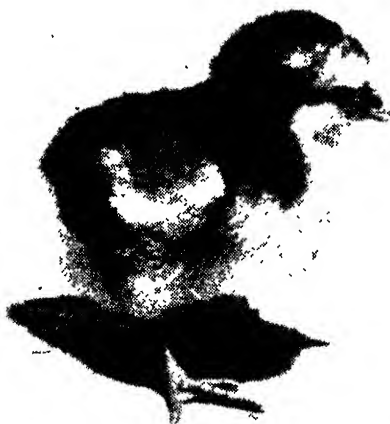


FIG. 1.—Day-old Black Australorp Chick.

The three breeds mentioned still possess many shortcomings, and the question arises whether we should aim at supplementing the shortcomings of these three breeds or whether we should develop a totally new breed. A number of new breeds have been developed mainly for the purpose of distinguishing the sex of day-old chicks. Some of these breeds made their appearance in England more than fifteen years ago. Up to the present they have been of little economic value to the poultry industry, their value having been exclusively academic. The writer is of the opinion that, for immediate results, the existing breeds, with their years of breeding, may be developed in such a manner as to allow of the realization in them to a considerable extent of the ideals aimed at. The future will show whether any of these new breeds will be of economic importance to the industry.

Rate of Feather Growth an Economic Factor.

In the breeding of the ideal bird, various economic factors, apart from those already mentioned, must be taken into account.

An examination of the country's popular dual-purpose breeds shows that all these breeds will benefit considerably if the factors for rapid feather growth, as well as the other factors mentioned, are introduced by breeding.

Slow feather growth is particularly noticeable in the heavy breeds, such as Rhode Island Reds, Australorps, Buff Plymouth Rocks, etc. In Leghorns feather growth is practically always rapid. Chicks whose feathers grow slowly are a real problem, since they get cold sooner and consequently require heat for a longer time,

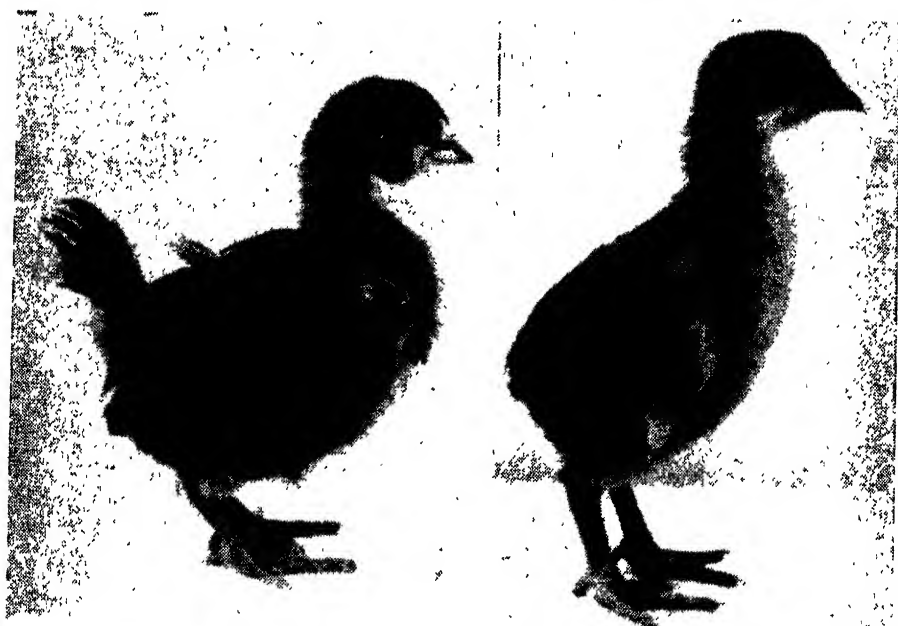


FIG. 2.—Left: Australorp chick with rapid feather growth at the age of 16 days. Note the long tail and wing feathers.

Right: Australorp chick with slow feather growth at the age of 16 days. Note the short tail.

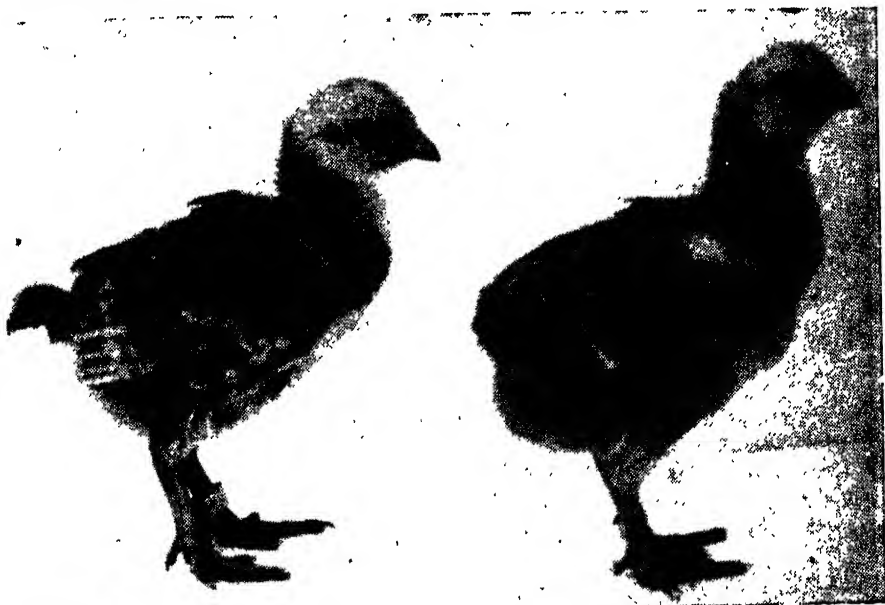
grow slower than those with rapid feather growth, and are therefore not marketable at as early an age—a very important factor in our dual-purpose breeds. Further, there is the problem of cannibalism in the form of feather eating, which can, to a large extent, be prevented. Birds with rapid feather growth are covered with feathers at the age of two weeks, and there are few external signs of pin feathers. In birds with slow feather growth, however, pin feathers are always visible, even up to the age of 12 weeks and more. These pin feathers give rise to feather eating which may develop into a troublesome form of cannibalism. The presence of pin feathers makes it very difficult to clean cockerels which are slaughtered at an early age. Even during warmer periods, the bird with rapid feather growth completes the moulting process much sooner than the bird with slow feather growth.

It is true that approximately 50 per cent. of the differences in feather growth occurring in a flock are caused by factors other than hereditary factors. It is a matter of common knowledge that feeding,

INBREEDING OF RAPID FEATHER GROWTH.

temperature, humidity, management, etc. will all influence feather growth. The rate of feather growth is, however, definitely a hereditary factor which may be bred into a flock. It is generally known that the birds with rapid feather growth are those which make the most rapid growth in the flock.

Hereditary variations in feather growth are caused by the influence of the dam and sire. On the whole, feather growth in hens is more rapid than in cocks, and at a given age a larger percentage of hens than cocks in the flock will be completely covered with feathers.



(Top Left).

FIG. 3A.—Rhode Island Red chick with rapid feather growth at the age of 16 days. Note the long tail and wing feathers.

(Top Right).

FIG. 3B.—Rhode Island Red chick with long wing feathers at the age of 16 days. Tail development is lacking, however, and this type of chick cannot be used for the breeding of rapid feather growth.



(Under).

FIG. 3C.—Rhode Island Red chick with slow feather growth at the age of 16 days.

It is interesting to note the position in our flocks as regards this character. As has already been stated, feather growth is prac-

tically always rapid in Leghorns. In the Plymouth Rock and Light Sussex, feather growth is, with a few exceptions, always slow, especially in the former. In Rhode Island Reds and Wyandottes, there is usually a high percentage of both slow and rapid feather growth. In Black Australorps feather growth is almost invariably slow. Observations in connection with feather growth in the Australorp and Rhode Island Red are given in Table I.



FIG. 4.—Left: White Australorp chick with rapid feather growth at the age of 4 weeks.

FIG. 4.—Right: White Australorp chick with slow feather growth at the age of 4 weeks.

TABLE I.—Rate of feather growth in the Australorp and Rhode Island Red.

Breed.	Number of Breeding Cocks.	Number of Breeding Hens.	Number of Chicks.	Number with Rapid Feather Growth.		Percentage with Rapid Feather Growth.	Hens which Breed Birds with Rapid Feather Growth.	Cocks which Breed Birds with Rapid Feather Growth.
				Cocks.	Hens.			
Rhode Island Red	11	123	1,206	85	187	22.5	13	7
Black Australorp	31	305	3,407	8	43	1.4	5	2

From the foregoing figures it is clear that in the Black Australorp, one of our most popular breeds, feather growth is extremely slow while the bird is young. The Black Australorp and Rhode Island Red, however, differ in as much as the Rhode Island

INBREEDING OF RAPID FEATHER GROWTH.

Red generally has a very much better feather covering during the first six to eight weeks than the Black Australorp. At the age of twelve weeks, however, the Black Australorp makes up the leeway and at this age the chicks of the latter breed are well-covered with feathers and pin feathers are no longer visible on the surface. Among Rhode Island Reds, on the other hand, there will be chicks, especially cockerels, which at this age still have bare backs or backs on which pin feathers are visible.

Rate of Feather Growth can be Introduced by Breeding.

As has already been stated, the rate of feather growth is hereditary. It is determined by a single factor or gene which indicates sex linkage. The factor is therefore related to the sex chromosome which consequently greatly simplifies its transmission. Various other hereditary factors also have a certain bearing on the rate of feather growth, but they only modify the rate of growth which is determined by the principal sex-linkage gene, and are therefore relatively unimportant.

If, therefore, the aim is to introduce this characteristic into a flock by breeding, the first step must be to determine whether any of the birds possess this sex-linked gene for rapid feather growth. If such birds are totally absent, they will have to be purchased and the character gradually bred into the flock. The propagation of this factor in practice is further simplified by the fact that the factor inducing rapid feather growth is recessive to that resulting in slow feather growth.

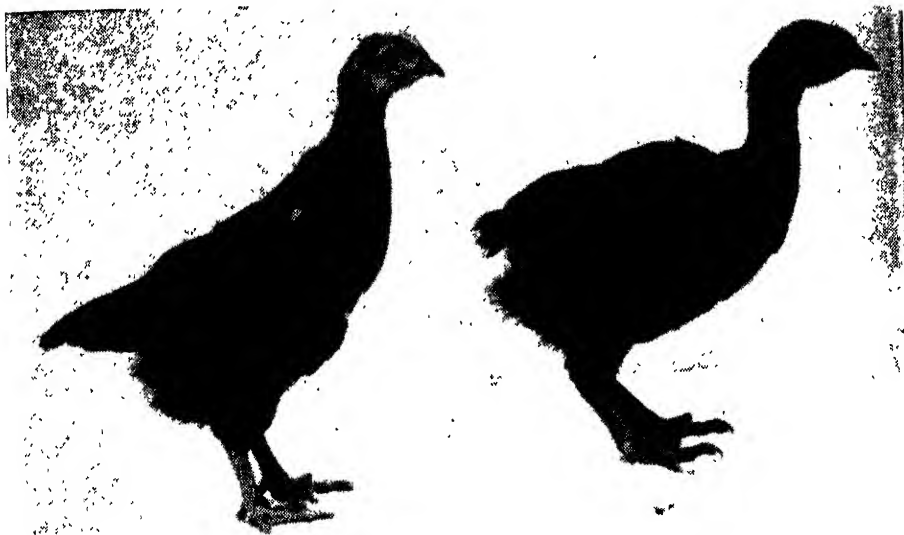


FIG. 5.—*Left:* Rhode Island Red chick with rapid feather growth at the age of 8 weeks.
Right: Rhode Island Red chick with slow feather growth at the age of 8 weeks.

How then, are birds with rapid feather growth identified? The difference is already noticeable in day-old chicks, but inexperienced persons will find it difficult to observe the difference at such an early age. At the age of 10 to 16 days the differences between birds with rapid and those with slow feather growth are so conspicuous that it is impossible to make a mistake.

Birds with rapid feather growth may be distinguished by the fact that at the above-mentioned age they show good wing-feather development. If the wing is folded, the wing feathers reach to the

tail or even further. The tail is well-developed and from half an inch to one inch long. There are two types of chicks with slow feather growth. In the first, chicks of the mentioned age will have a wing-feather development of practically the whole length of the body, but no tail-feather development. The second type of chick will show no tail or wing-feather development.

From table I it will be observed that more hens than cocks possess the character of rapid feather growth. It is a normal phenomenon in a mixed flock due to the mode of transmission.

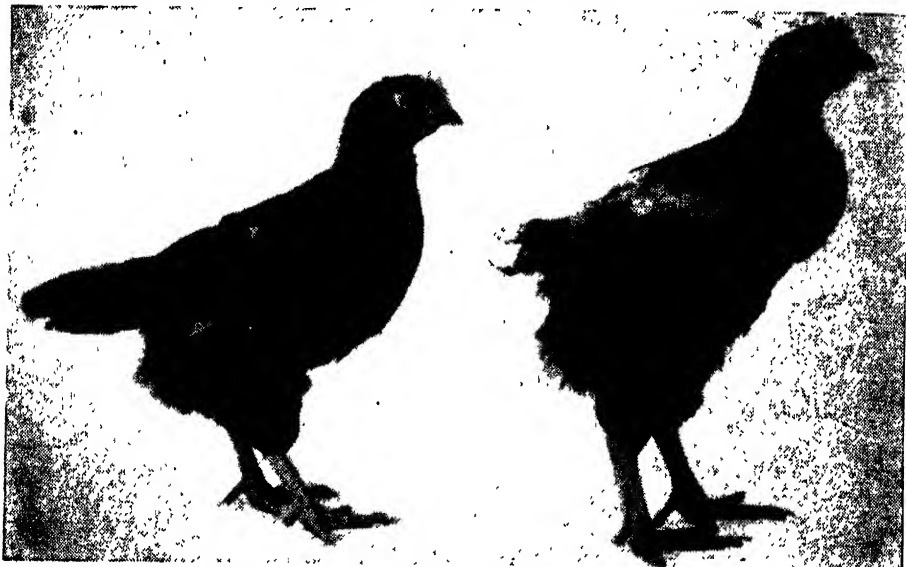


FIG. 6.—*Left*: Rhode Island Red chick with rapid feather growth at the age of 12 weeks.
Right: Rhode Island Red chick with slow feather growth at the age of 12 weeks.

Fundamentals of Inbreeding of Feather Growth.

The following few fundamentals in connection with heredity must be borne in mind when starting a breeding programme for the purpose under discussion. The breeding will have to be planned according to the presence or absence of these characteristics in the flock.

A. Cocks.

- (1) Cocks possess two genes for feather growth. One is inherited from the dam and the other from the sire.
- (2) A cock with rapid feather growth breeds true for rapid feather growth, but a cock with slow feather growth may carry a gene for rapid growth.
- (3) The cock is exclusively responsible for the rate of feather growth of his daughters. The rate of feather growth in his daughters will, therefore, be a direct criterion of the genetic make-up of the cock as regards feather growth.

B. Hens.

- (1) Hens possess only one gene for feather growth. They, therefore, always breed true for the type of feather growth which they display.
- (2) Hens always transmit their rate of feather growth to their sons—never to their daughters.

INBREEDING OF RAPID FEATHER GROWTH.

In order to breed rapid feather growth quickly into a flock, it is essential to use a cock which possesses this character in its genetic make-up, since hens cannot transmit this characteristic to their *daughters*. If hens with rapid feather growth only are available, they may be mated with any cock. In the first generation, i.e. in cocks as well as in hens, feather growth will always be slow. Although the daughters from the latter mating will be useless for further breeding for the purpose under discussion, the *sons* may be mated with hens with rapid feather growth. Half the progeny of both cocks and hens of this second mating will be rapid feather growers.

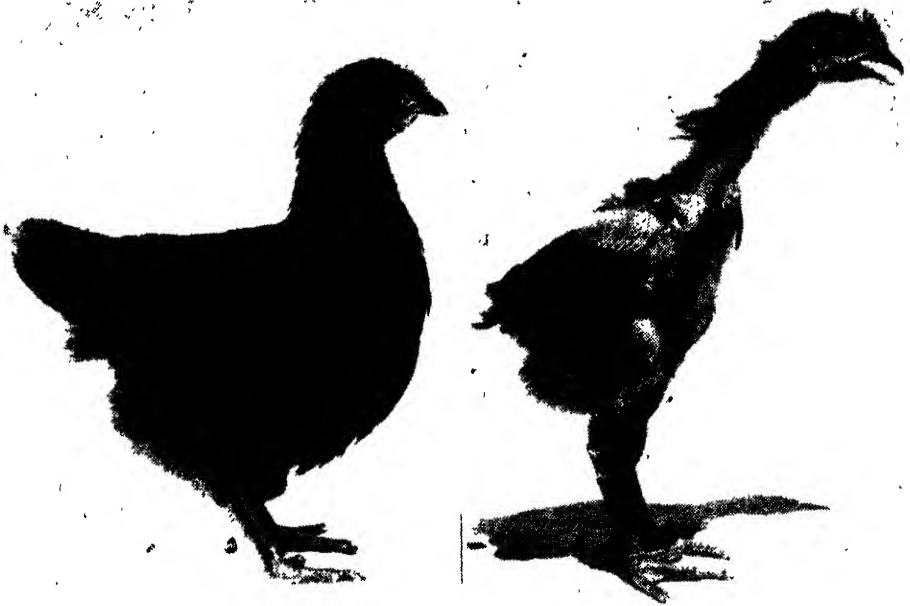


FIG. 7.—*Left*: Australorp chick with rapid feather growth at the age of 14 weeks.
Right: Australorp chick with slow feather growth at the age of 14 weeks.

The matter is very simple if cocks with rapid feather growth are mated with hens which possess the same character, for in this case all the progeny will breed true for rapid feather growth. It should be realized that if the introduction of new blood into a strain of rapid feather growers thus established becomes necessary, it will have to be determined beforehand whether the new bird possesses the character of rapid feather growth. Another, and perhaps easier expedient, will be to introduce strange *hens* without the quality of rapid feather growth. The sons from the mating of these hens with cocks with rapid feather growth, cannot be used again. The *daughters*, however, will transmit the factor for rapid feather growth if they are mated with cocks of the strain with rapid feather growth.

If a farmer decides to start breeding a strain with rapid feather growth, the simplest procedure will be to purchase a cock which possesses this character. Such a cock will, however, be most difficult to obtain. If such a cock is mated with hens with slow feather growth, all the *hens* from this mating will have rapid feather growth. Although the cocks of the progeny will be slow feather growers themselves, they will nevertheless be able to transmit rapid feather growth to their progeny. If the daughters with rapid feather growth

from this mating are mated again with a cock with rapid feather growth, they will produce exclusively progeny with rapid feather growth.



FIG. 8.—Cock with slow feather growth at the age of 12 months. The wing arches are not yet covered with feathers.

Identification Marks for Chicks with Rapid Feather Growth.

This hereditary character of rapid feather growth may be bred into any flock without difficulty. If all the chicks already receive wing bands, all ordinary wing bands may be attached to the left wing. At the age of from ten to fifteen days all those with rapid feather growth receive another band on the right wing. If flock mating is applied and no wing bands are used, the chicks with rapid feather growth may be marked at the age of from ten to fifteen days on the right wing with a band or any other object. The birds with rapid feather growth may then easily be distinguished at any age without a complicated recording system.

Control of Household Insects.

This Bulletin, No. 192 (third edition), has been revised and a new chapter on D.D.T. and Gammexane Insecticides has been added. Price 6d. per copy. Obtainable from the Editor of Publications, Pretoria.

Investigations on the Composition of South African Milk.

The Milk Supplied to Condenseries.

S. Bakalor, Dairy Section, Agricultural Research Institute, Pretoria.

IN the past few years, intensive short-term studies have been made at this Institute on the Pretoria city milk supplies ('') (''). While it was possible to obtain some detailed information about the present quality of city milk from these investigations, it is clear that any research programme dealing with the milk supplies of the country as a whole will have to include the study of analytical results extending over much longer periods and covering wider areas, in order to ascertain what trends are occurring in the solids content of milk in various regions of the Union. If information on long-term trends in the composition of milk had to be dependent on regular analyses made at this Institute, it would be many years before these data could be obtained, as the present series of studies has been in progress for only a relatively short period.

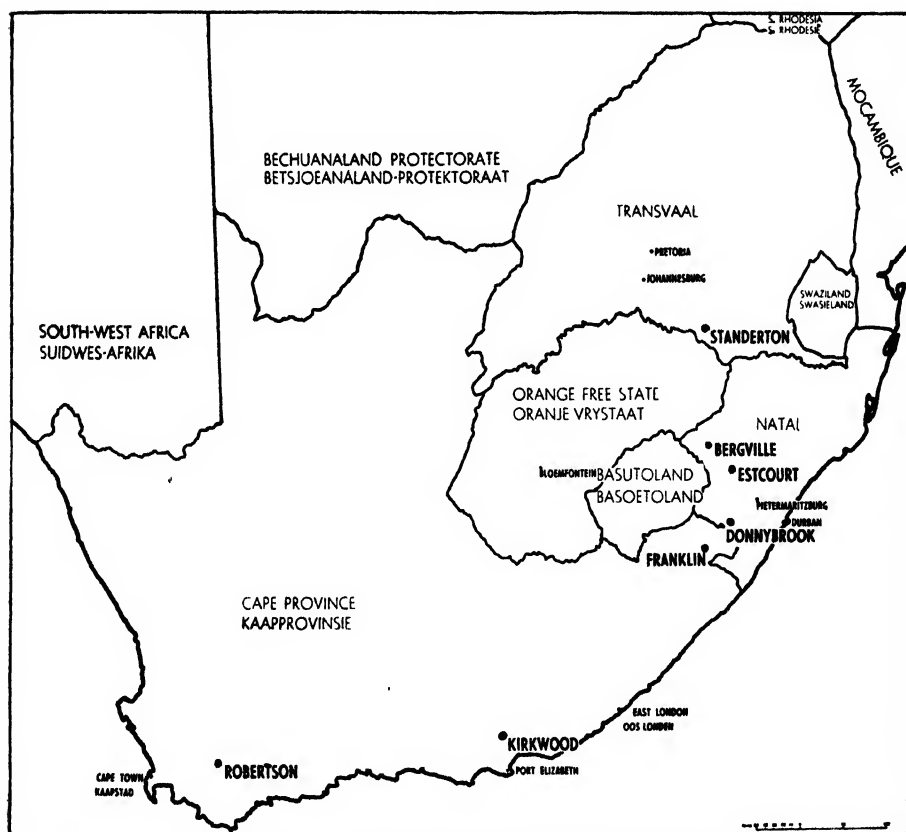


FIG. 1.—Condenseries in the Union (shown in prominent type).

Fortunately, such long-term data on milk are available in the records of local condenseries. Before the milk which is received at any of these factories is condensed, the ratio of the fat to the S.N.F.

(solids-not-fat) must be standardized to ensure that the resultant condensed milk complies with the minimum legal requirements for these constituents*. This standardization involves the analysis of all the bulked supplies of milk received. The results of such analyses would, accordingly, furnish a complete record of the composition of the milk produced in the supply area of each condensery since it was established.

The condensed-milk manufacturers in the Union were approached for data on the composition of their milk supplies, and were very willing to assist this Institute in its investigations. Through their interest and co-operation it was possible to obtain monthly and annual averages for the fat and S.N.F. contents of milk received at the Estcourt, Franklin and Robertson condenseries, as well as the monthly averages for fat and total solids † of milk received at the Bergville plant. (The actual period and number of years covered by the data in each case are indicated in Table II.) In addition, the composition of all the batches of milk analysed at Bergville over a period of twelve months was also recorded.

The Estcourt and Franklin condenseries were started in the late 1920's, whereas the Bergville and Robertson factories commenced operating during the early part of the Second World War.

At Bergville, the milk for condensing is analysed for both total solids and fat by the Mojonnier method. At the other condenseries the fat content is determined by the Gerber method, and the total solids and S.N.F. contents are estimated by means of Richmond's formula, from the fat test and lactometer reading.

The Milk Supply Areas of Condenseries.

There are, at present, seven registered condenseries in the Union. Their location is shown in Figure 1. With the exception of the plant at Robertson, these factories are all situated in the summer-rainfall area. Some details of the rainfall and temperature conditions in the areas in which the milk discussed in this investigation was produced, are given in Table I.

It should be noted that wide variations in rainfall can occur within an area. Thus at Draycott in the Estcourt area the annual rainfall during 1942 was 29 inches, whereas at Estcourt itself it was 36.29 inches.

Estcourt and Bergville Areas.

The Estcourt and Bergville condenseries draw their supplies from two adjoining areas in the Natal midlands, towards the slopes of the Drakensberg. Between these two factories there is also a powdered-milk plant at Winterton, on the Estcourt-Bergville branch railway line. Water, from springs and rivers, is fairly plentiful, even in drought periods, but the erodibility of the soil and the low carrying capacity of the veld make large portions of these areas

* According to the regulations framed under the Foods, Drugs and Disinfectants Act (No. 13 of 1929), sweetened condensed milk must contain a minimum of 20 per cent. milk solids-not-fat and 8 per cent. of milk fat, i.e. a ratio of S.N.F. to fat of 2.5 to 1. Unsweetened condensed milk or evaporated milk must contain a minimum of 18 per cent. of milk solids-not-fat and 8 per cent. of milk fat, i.e. a ratio of S.N.F. to fat of 2.25 to 1.

† Total solids = Fat + S.N.F.

COMPOSITION OF SOUTH AFRICAN MILK.

unsuitable for intensive dairying. The veld types in the Estcourt-Bergville regions, and their relationship to farming practices and soil erosion problems, have been discussed in some detail by Pentz ⁽³⁾ ⁽⁴⁾ ⁽⁵⁾.

Typical supplements fed to stock are cowpea and veld hay, stover, maize and grass silage. When obtainable, mealie-meal and similar concentrates form part of the winter ration. As in most of the other dairy sections of the Union, mastitis appears to be very prevalent.

TABLE I.—*Climatic conditions in the supply areas of the various condenseries.*

Area.	Annual Rainfall (Ins.)				Mean Air Temperature (1921-1940)	
	Period.	Highest.	Lowest.	Mean.	January.	July.
Estcourt.....	1929-45	50·15	16·86	28·94	70·8	49·9
Franklin.....	1929-45	43·21	24·15	30·47	66·4	48·1
Bergville.....	1941-45	58·83	21·58	36·66	—	— *
Robertson.....	1941-45	14·99	11·83	12·31	73·0	51·4

* No temperature recording station in area.

Even in the older of these two condensery supply areas, namely Estcourt, dairying is mainly of a semi-intensive nature. On many Estcourt farms, calves run with the cows during the day and are separated from them at night. These cows are milked once a day only, in the early morning.

Franklin Area.

The Franklin condensery is situated in one of the most important dairy-farming sections of the Union, namely East Griqualand, which produces a large quantity of cheese as well as condensed milk. Dairy farming is of a fairly intensive type. A great drawback to milk production in this area, however, is its long severe winter period. In fact, the average duration of the frost period is over 120 days per annum, whereas at Estcourt it is only 97 days. (*) Adequate provision for winter feeding of stock is therefore essential. The winter ration is usually made up of mealie-meal (if obtainable), maize silage, teff, hay, swedes, turnips, chou moellier, pumpkins and melons. As a rule, there is little or no supplementary feeding in summer.

Robertson Area.

This area is characterized chiefly by its low annual rainfall, about two-thirds of which occurs in the period May to October. Milk is produced on farms along the valley of the Breede River and its tributaries. About half the farms receive irrigation water from the Breede River Conservation Board Scheme. On the rest, which are served by minor irrigation projects, production is more directly dependent on the scanty rainfall. Dairying is still regarded by many farmers as a side-line.

During July and August the bulk of the milk supply is produced on natural grazing. This veld-grazing period may be consi-

derably lengthened either way in years of good rainfall. From September onwards, lucerne grazing provides the main feed, but the usual shortage of irrigation water from February onwards considerably shortens the lucerne season. Until the winter rains set in again, supplements such as chaff and lucerne hay are fed, but these feeds are often lacking in quality and amount.

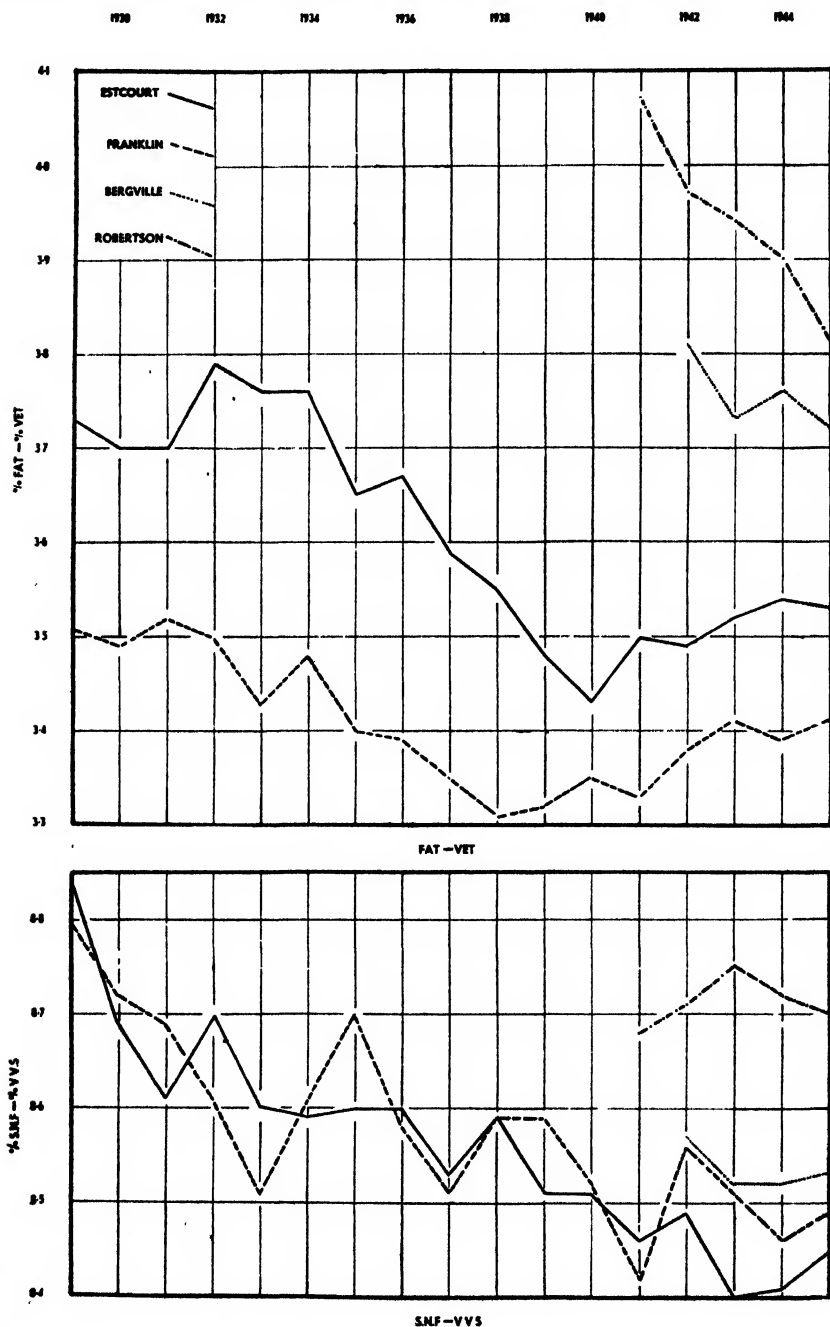


FIG. 2.—Annual variations in the composition of milk received at various condenseries.

COMPOSITION OF SOUTH AFRICAN MILK.

Composition of the Milk.

The mean composition of the milk received at the condenseries, over the various periods for which data were available, is shown in Table II

TABLE II.—*Mean composition of milk received at condenseries.*

Condensery.	Period.	No. of Years.	Total Solids.	Fat.	Solids-not-fat.
Estcourt.....	Jan. 1929-Dec. 1945	17	% 12.17	% 3.61	% 8.56
Franklin.....	Jan. 1929-Dec. 1945	17	11.99	3.41	8.58
Bergville.....	Oct. 1941-Sept. 1946	5	12.26	3.73	8.53
Robertson.....	Jan. 1941-Dec. 1946	6	12.63	3.92	8.71
Mean for all factories*...	.....	.....	12.17	3.59	8.58

* Weighted according to years.

It will be seen that the richest milk was received at Robertson. The fact that about 60 per cent. of the herds in this area are of the Jersey type, whereas in other areas the cows are largely of the Friesland type, undoubtedly explains this different in composition.

The trends in the composition of milk in these different areas are shown in Table III (illustrated by Figures 2 and 3).

The most striking point in these data and graphs is the steady decline in the solids content of the milk produced in the Franklin and Estcourt areas. There does, however, appear to be a slight tendency, during the past few years, for the milk in both these areas to become richer in fat. No adequate study of the long-term trends in the quality of the milk supplies of the two newer condenseries can be made as yet, but even over the short periods for which data are available, a decline is noted in fat content, especially in the case of the Robertson milk. Any marked change in the S.N.F. content of Robertson or Bergville milk is not apparent, but during the year ending in September 1946, the milk received at the latter factory averaged only 8.43 per cent. S.N.F. During these twelve months, the mean S.N.F. content of this milk was below the 8.5 per cent. standard for the first time, whereas at Estcourt it had fallen below this standard since 1941. At Robertson, the annual mean has, as yet, always been above 8.5 per cent. S.N.F.

In Table IV and Figure 4, more details are present on the milk received at Bergville over a twelve-months' period. The coefficients of variability show that there are only small variations in the composition of the batches of whole milk handled over this particular year.

While no batch of milk was below standard for fat, 45.6 per cent. of these batches fell below the 8.5 per cent. standard for S.N.F. In a previous one-year's study of the milk supplied to a Pretoria city milk plant, it was found that 35.4 per cent. of the milk sent in by producers was below standard for S.N.F., whereas only 2.8 per cent. was below the standard for fat (²). As the milk supplied to cities must comply with the legal standards which are enforced by municipalities, it is not surprising that city milk in

TABLE III.—*Annual variations in the composition of milk received at condenseries.*

Year.	Yearly Average.			5-Year Moving Average.		
	Total Solids. %	Fat. %	S.N.F. %	Total Solids. %	Fat. %	S.N.F. %
(a) ESTCOURT.						
1929.....	12.57	3.73	8.84	—	—	—
1930.....	12.39	3.70	8.69	—	—	—
1931.....	12.31	3.70	8.61	12.43	3.74	8.69
1932.....	12.49	3.79	8.70	12.38	3.74	8.64
1933.....	12.36	3.76	8.60	12.35	3.73	8.62
1934.....	12.35	3.76	8.59	12.35	3.73	8.62
1935.....	12.25	3.65	8.60	12.26	3.68	8.58
1936.....	12.27	3.67	8.60	12.22	3.64	8.58
1937.....	12.12	3.59	8.53	12.16	3.59	8.57
1938.....	12.14	3.55	8.59	12.09	3.54	8.55
1939.....	11.99	3.48	8.51	12.03	3.51	8.52
1940.....	11.94	3.43	8.51	12.00	3.49	8.51
1941.....	11.96	3.50	8.46	11.95	3.48	8.47
1942.....	11.98	3.49	8.49	11.95	3.50	8.45
1943.....	11.92	3.52	8.40	11.96	3.52	8.44
1944.....	11.95	3.54	8.41	—	—	—
1945.....	11.98	3.53	8.45	—	—	—
(b) FRANKLIN.						
1929.....	12.31	3.51	8.80	—	—	—
1930.....	12.23	3.49	8.74	—	—	—
1931.....	12.21	3.52	8.69	12.16	3.49	8.67
1932.....	12.11	3.50	8.61	12.11	3.48	8.63
1933.....	11.94	3.43	8.51	12.08	3.46	8.62
1934.....	12.09	3.48	8.61	12.04	3.44	8.60
1935.....	12.10	3.40	8.70	11.99	3.41	8.58
1936.....	11.97	3.39	8.58	11.99	3.39	8.60
1937.....	11.86	3.35	8.51	11.94	3.35	8.59
1938.....	11.90	3.31	8.59	11.90	3.34	8.56
1939.....	11.91	3.32	8.59	11.86	3.33	8.53
1940.....	11.87	3.35	8.52	11.87	3.34	8.53
1941.....	11.75	3.33	8.42	11.88	3.36	8.52
1942.....	11.94	3.38	8.56	11.86	3.37	8.49
1943.....	11.92	3.41	8.51	11.87	3.38	8.49
1944.....	11.85	3.39	8.46	—	—	—
1945.....	11.90	3.41	8.49	—	—	—
(c) BERGVILLE.						
1942.....	12.48	3.81	8.57	—	—	—
1943.....	12.25	3.73	8.52	—	—	—
1944.....	12.28	3.76	8.52	—	—	—
1945.....	12.25	3.72	8.53	—	—	—
(d) ROBERTSON.						
1941.....	12.75	4.07	8.68	—	—	—
1942.....	12.68	3.97	8.71	—	—	—
1943.....	12.69	3.94	8.75	—	—	—
1944.....	12.62	3.90	8.72	—	—	—
1945.....	12.51	3.81	8.70	—	—	—
1946.....	12.52	3.85	8.67	—	—	—

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the above case appears to be less deficient in S.N.F. than industrial milk, over which no such control exists. It is the practice of condenseries to reject milk testing below 3 per cent. fat, but milk below standard for S.N.F. alone could not be rejected, as this would obviously result in the elimination of too great a percentage of the supplies.

TABLE IV.—*Percentage distribution for various constituents of milk received at Bergville condensery.*
(Batches of milk analysed prior to standardization: 12-months' period)

(a) Total Solids.		(b) Fat.		(c) Solids-not-fat.	
Class Range (Interval = 0.25%)	% of Total No. of Samples.	Class Range (Interval = 0.25%)	% of Total No. of Samples.	Class Range (Interval = 0.25%)	% of Total No. of Samples.
11.25-11.49	0.1	3.00-3.24	0.4	7.50-7.74	0.2
11.50-11.74	0.9	3.25-3.49	2.3	7.75-7.99	0.4
11.75-11.99	12.0	3.50-3.74	41.5	8.00-8.24	4.8
12.00-12.24	30.6	3.75-3.99	34.4	8.25-8.49	40.2
12.25-12.49	26.2	4.00-4.24	17.2	8.50-8.74	45.7
12.50-12.74	18.7	4.25-4.49	3.8	8.75-8.99	8.3
12.75-12.99	9.0	4.50-4.74	0.4	9.00-9.24	0.3
13.00-13.24	2.3	—	—	9.25-9.49	0.1
13.25-13.49	0.2	—	—	—	—
	100.0		100.0		100.0

	Mean.	Coefficient of Variability.
Total Solids.....	12.34	2.60
Fat.....	3.82	6.06
S.N.F.....	8.52	2.24

Causes of Decline in Solids Content and Deficiencies in Milk.

The opinion is at times expressed that the shortage and high prices of concentrates and other supplementary feeds during, and since, the war period are to blame for the present deficiencies in the composition of milk supplies. It will, however, be seen that the decline in the solids content of Estcourt and Franklin milk commenced long before the outbreak of war, and thus the present lack of concentrates cannot be blamed for the long-term fall in the quality of milk. Available information appears to show that nutrition has an influence on the S.N.F. content of milk (²). In contrast to this, however, feeds have no influence on the fat content, which has also shown a marked decline, even during the few years in which the newer condenseries have been operating. It is interesting to note from Figure 3 that the fat content of the milk supplied to the two older condenseries has recently shown a tendency to rise, that is, during the actual years in which there was a shortage of protein feeds.

In the study on the Pretoria city milk supply area, it was shown that the S.N.F. content of milk rises markedly during that portion of the year when early seasonal rains bring about an increase in the nutritive value of young veld grass (²). It may be that straining of the carrying capacity of veld in the condensery supply areas,

together with the present shortage of concentrates, has resulted in the underfeeding of stock, and thus, to some extent, depressed the S.N.F. content of the supplies. Mastitis infection, which is prevalent in these areas, lowers the S.N.F. percentage of milk. There

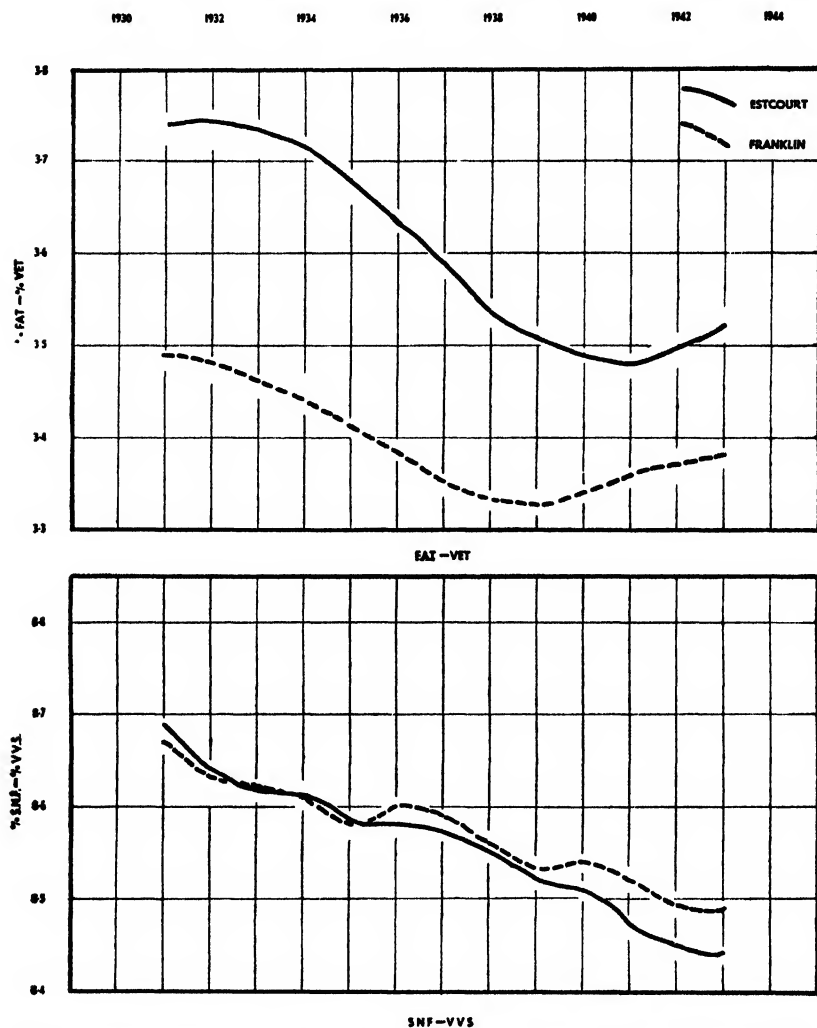


FIG. 3.—Five-year moving average for fat and S.N.F. content of milk produced in the Estcourt and Franklin areas.

is, however, no evidence to prove that infection by this disease is on the increase. In fact, the dairy farmer to-day is more conscious of the losses he suffers from this disease, than his predecessor was, and is thus inclined to take what measures he can to combat the disease. Mastitis may then be regarded as a factor tending to depress the S.N.F. content of milk, but cannot be blamed for the progressive decline in quality.

It was noted that the fat, as well as the S.N.F., content of milk declined in the areas concerned. It is further known that there is some positive relationship between the mean fat and S.N.F. contents of milk; e.g. the milk of Jersey cows, which is higher in

COMPOSITION OF SOUTH AFRICAN MILK.

fat than that of Friesland cows, is also higher in S.N.F. than the milk of the latter breed. A significant positive relationship was found between the annual means for fat and S.N.F. in the case of the supplies of the Estcourt and the Franklin condenseries.* It thus appears that there must be other factors causing long-term changes in the composition of milk.

In this connection it is necessary to examine the changes that have occurred in the cattle population of each area. About twenty years ago there was a large number of Afrikaner and other cows of indigenous stock in the Estcourt area, as well as some Ayrshires, Brown Swiss and Frieslands. At present, the herds are mainly of the Friesland type, with a few Red Polls, South Devons and other breeds. A number of Friesland-Afrikaner and other crosses are found, but the original Afrikaner stock has been largely eliminated. In the Franklin area grade Frieslands predominate strongly and there does not appear to have been much change in the cattle population since the condensery opened.

Before the factory started at Bergville the cattle in the area were mainly of Afrikaner and dual-purpose types. At present, however, Friesland blood predominates, with some Ayrshire, Jersey, Brown Swiss and Red Polls, as well as a number of herds consisting of cross-breeds, scrubs and mixed types. Since 1941 the Friesland has been gradually replacing other types. At Robertson, the Friesland herds are in the minority (about 40 per cent. of the total), the majority of the herds being Jerseys. The popularity of the latter breed is apparently due to its ability to stand up to the adverse conditions in the area.

The Friesland cow, on the other hand, is popular because of its comparatively higher yield of milk, even though this milk usually has a lower test for fat and S.N.F. than that of other breeds. Since all the condenseries, except the one at Robertson (for the past year or so), buy milk on a gallonage basis, it is obvious that the producer will try to increase the volume of his supplies as much as possible.† There has thus been a tendency to breed for quantity rather than quality of milk. Even with this breeding for higher production, it is doubtful, however, whether in most of the areas the average yield per cow, throughout the year, is as much as one gallon per day. Underfeeding, especially in winter, probably restricts the potentially higher yield. (It is obviously impossible to deal with the milk intakes of factories in this report. Thus the relationship between the amount and composition of milk supplied to any one plant cannot be discussed.)

In studying the milk supplies of the Estcourt and Franklin plants, the distinct difference in the fat content of the two milks is as marked as the general decline in solids content (see Figures 2 and 3). From year to year, Estcourt milk is consistently higher in fat (at times as much as 0.33 per cent.) than Franklin milk. In contrast, there is only a slight difference in the mean S.N.F. content of the two milk supplies. There has, indeed, been a tendency during the past ten years for Franklin milk to be a little richer in S.N.F. than Estcourt milk. From a study of the S.N.F. trends

* For Estcourt, the correlation coefficient (r) between the annual means for fat and S.N.F. over 17 years is + 0.7264. For Franklin, this correlation coefficient is + 0.6547.

† Since this report was written, the Dairy Industry Control Board has announced its intention to make compulsory the purchase of milk, by cheese factories and condenseries, on a butterfat basis as from 1 October, 1948. (Circular No. 20/47 of 10 July, 1947.)

alone, it would appear that the milk produced in these two areas was very similar in composition. The fat contents show that this is not the case.

As indicated, the herds near Franklin are overwhelmingly of the Friesland type. At Estcourt, however, there appears always to have been a fair number of cows of other types, such as unimproved "native" stock, which give a milk richer in fat than the grade Friesland. For example, cows of the "Black Afrikaner" type, are found in this area. Over two recent years, the milk of one herd of "Black Afrikaner" cows averaged 3.76 per cent fat and 8.89 per cent S.N.F. These figures are much higher than the mean for the Estcourt area as a whole. It seems, therefore, that the difference in the mean fat content between the supplies of the two factories is largely due to genetic differences in the two local cattle populations. In recent years, this difference in fat content appears to have lessened slightly. This may be caused by the tendency for the cattle in these areas to become more similar in type.

The S.N.F., as well as the fat content, of milk is affected by breeding. The S.N.F. content, however, may also be affected by other factors, such as the standard of feeding (²). This may explain why the two supplies of milk are so similar in their S.N.F. content, and so different in their percentage fat.

With regard to the newer condenseries, it will be noted that the fat content of the Robertson milk is much higher than, and that of the Bergville milk just as high as, the milk supplied to the Estcourt condensery during its early years. The milk received at the Robertson plant during its first five years, however, is little different in S.N.F. content from the earlier supplies of the two older condenseries. Bergville milk has, from the start, been only slightly richer in S.N.F. than the present, comparatively poorer, supplies of these older plants. The changes that have already occurred in the milk of the newer supply areas, show that there must be some factors depressing the quality of milk, which are common to all the regions discussed.

An aspect of these differences in composition which is of practical concern in condensery operations, is the ratio of fat to S.N.F. in the milk received. In the manufacture of sweetened condensed milk, a ratio of 2.5 to 1 for milk solids-not-fat to fat is desired. At Franklin, the milk received has an average ratio for S.N.F. to fat of 2.52 to 1. At Estcourt, where the milk is relatively richer in fat, this ratio is 2.37 to 1. In fact, the milk of most of the condenseries, except Franklin, appears to be too rich in fat in relation to the S.N.F., for the manufacture of the above product. Thus a certain portion of the fat in each batch of milk has to be separated off during standardization, in order to obtain the correct ratio of fat to S.N.F. in the milk to be processed. The surplus cream so obtained can be used in the preparation of other products.

Improving the Quality of Milk.

An examination of the data shows that there has been a decline in the solids content of the milk received by the older condenseries in South Africa. This raises the question as to what should be done to bring about an improvement in the position. In considering the problem, it must be borne in mind that the condenseries are

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primarily interested in the solids content of milk. In the condensing process about 60 per cent. of the water content of the milk has to be removed. This is a costly process, and it is therefore clear that

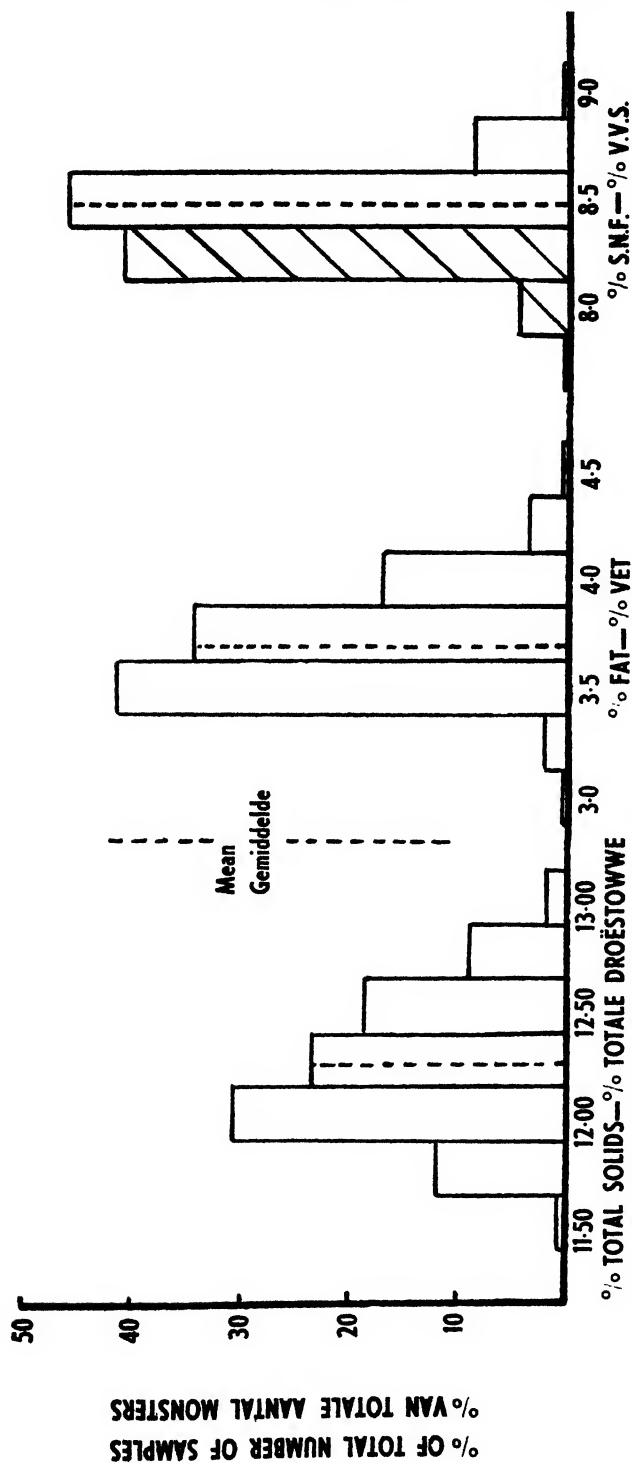


FIG 4.—Percentage distribution for various constituents of milk received at Bergville condensery. (Batches of milk analysed prior to standardization—12 months' period.)

milk which is high in solids is preferable to milk which is low in solids. On the other hand, the fat content must not be too high in relation to the S.N.F. content.

The results detailed in this article prove, without doubt, that the yield of condensed milk per gallon of whole milk purchased by the older condenseries, has definitely fallen during the past 17 years. From the data available, it does not appear unlikely that a similar decline in yield will occur at the newer condenseries in future years. This lowered yield must be of concern to the condenseries, especially since more is paid for whole milk at present than was paid during the times when the milk was much higher in solids.

The payment for milk on a quality rather than a quantity basis, e.g. on the solids content rather than the gallonage, would appear to be the immediate remedy. With the incentive to keep only stock giving milk rich in both fat and S.N.F., the farmer would gradually eliminate cows yielding poor milk. With various sections of the industry, e.g. city milk plants and cheese factories, competing for the milk supplies of an area, the policy of buying milk on a quality basis must obviously be a general one. It would be futile for one section of the industry to buy milk on a butterfat or total solids basis, if poorer quality milk from the same area could be sold elsewhere at a better price per gallon.

The dairy factory, whether it produces condensed milk, milk-powder or cheese, is, or should be, interested in obtaining as high a proportion of solids as possible in its milk intake. The aim of each dairy area should be to increase its total solids production as much as possible, without causing damage to the soil or veld. It has been mentioned that certain milk-producing areas of the country are regarded as unsuitable for intensive dairying. The argument may even be advanced that the decline in the solids content of milk has, in part, been caused by this overstraining of the milk-producing capacity of much of the farming country. Many such areas originally contained "unimproved" indigenous cattle, which were milked off the veld, and produced little milk, but milk rich in solids. Now these animals have been replaced by cows of imported breeds, which have been bred for more exacting conditions of feeding and management, and which yield more milk, but usually milk poorer in solids.

To try to intensify production in any area suited only to extensive farming must in time make it impossible for any dairying at all to be continued there. As a result, any dairy plant which is established in an area marginal to dairying, must be prepared to draw its supplies from further and further afield if it is to maintain a satisfactory output. An example of this is the Pretoria city milk market, situated in a district which can by no means be regarded as ideal for dairying. Before the war, the Pretoria district was able to satisfy the milk requirements of the city. Since the war years, with the increase in population, supplies have had to be drawn from other areas, and from the Johannesburg surplus milk pool. It is doubtful whether the old Pretoria supply area, even with increased purchases of feed, will ever be able again to produce the total needs of the city.

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That condenseries do realize the importance of improving dairy farming methods in their areas is shown by their appointment of field staff, and their assistance to producers in the purchase of stock, feeds, and other requirements. All such field work, however, can only be effective if it takes into account the natural limitations and potentialities of an area.

Because of the more detailed records kept by the condenseries it has been possible to trace the decline in solids content of their milk supplies. Such records are not available for other sections of the industry, but it would not be surprising to find similar trends in their milk intake, since the factors and conditions related to the production of milk for condenseries are in many respect similar to those affecting the production of milk for the city market and cheese factories. Thus the findings in this study must be of concern to all sections of the industry.

Acknowledgment is due to:—

(1) The Dairy Industry Control Board for providing the funds necessary for this investigation.

(2) Messrs. Nestlé (S.A.) Ltd., and Messrs. Union Milk Products, Ltd., for supplying the data on which this study is based.

(3) Messrs. J. A. Pentz and J. D. Scott, Research Officers, Estcourt; Mr. C. Lyle, Dairy Officer, Kokstad; Mr. Burger, Field Officer, Union Milk Products; and the managers of the various condenseries for information with regard to farming conditions in the various areas.

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Nursery Quarantines.

The following nursery was in quarantine on 1 October, 1947:—

Mooiuitsig Nursery, Private Bag, Nelspruit, for red scale on citrus (all).

The Activity of the "Vlamsiekte" Organism in Soils.*

Miss C. S. MacFarlane, Western Province Fruit Research Station, Stellenbosch.

DURING the past few years a great deal of attention has been paid to the environment of the plant. The soil has been studied not only chemically and physically but also in the light of new knowledge regarding its living inhabitants. Apart from the larger and more noticeable soil inhabitants, such as moles and earthworms, there is a vast amount of microscopic plant and animal life. The bacteria and the microscopic fungi make up the greater part of this. These small organisms are of great importance and the part they play in the health of crop plants is only now being fully realized. It has always been known that many diseases are caused by very small organisms, but now the value of the non-disease-producing types is being appreciated.

Two Main Groups of Soil Organisms.

These organisms can be divided into two main groups, namely, (a) those which cause disease, and require living hosts for their nourishment, i.e. the parasites; and (b) those which are able to gain their nourishment from dead material, i.e. the saprophytes. The second group is the larger. In dealing with the first group a further subdivision is needed, since some of these parasites are very specialized and can attack only one small group of higher plants—sometimes only one species or variety. These specialized parasites can often be controlled by crop rotations as the removal of their specific host is enough to bring about their death. The second sub-group, however, is not so easily controlled as they can live on many different plants, both crop plants and weeds, and so cannot be easily starved out. Many of them are also capable of living on dead material and so can exist in the absence of their hosts for long periods. The bacterium causing "vlamsiekte" *Erwinia vitivora* falls into this group.

The study of the organism causing "vlamsiekte" in the soil is complicated by the fact that soil infection plays a very small part in bringing about new infections, since the disease is spread mainly by the use of cuttings from contaminated stock or by pruning and cultural operations in vineyards already infected. In spite of this there is a danger from soil-borne infections as they would give rise to trouble as soon as the disease became established in the aerial parts of the vine where infection could quickly be spread by pruning or other necessary operations. The main point of danger would naturally be in the replanting of diseased vineyards after the original vines had been destroyed by the disease.

The organism causing "vlamsiekte" belongs to a group closely related to other bacteria which lead purely saprophytic lives, and so there is no difficulty in understanding their ability to exist without a living host. They are, however, not very strong growers and so tend to be overgrown by other soil bacteria unless their numbers can be added to regularly. This addition comes about through the

* A preliminary review.

“ VLAMSIKTE ” ORGANISM IN SOILS.

decay of diseased leaves and prunings lying on the soil. These are full of bacteria which escape into the soil when the tissues decay. In a vineyard which has been uprooted and destroyed, this source of bacteria would be active for only a limited time, that is until the last of the old material had decayed. After that period the bacteria would tend to decrease rapidly in the soil, and eventually they would be completely overgrown and destroyed. More work must be carried out in order to establish how long this would take, but several years would have to elapse before all danger to cuttings would be over. From the work so far done it appears that the bacteria only affect cuttings and plants which are in an unhealthy condition or which are wounded in the roots or underground parts.

Initial Investigation.

In June 1946, conditions arose on an experimental plot at Constantia which were very suitable for the investigation of possible soil infection. An area of infected vineyard had been planted out with different varieties of vines on Jacques roots. These had been in competition with full-grown, infected vines and had not thrived. They were removed and some showed signs of ill-health below soil level. Isolations were made from these cuttings and in four cases the bacteria obtained were those causing “vlamsiekte”. These bacteria gave typical symptoms of the disease when inoculated into healthy Sultana vines. The percentage infected was very small, but even that small percentage is a potential source of danger in heavily infected vineyards. At the same time infected leaves which were rotting on the soil, and some one and two-year-old prunings, were tested and bacteria were readily obtained from the leaves and the one-year-old prunings. A few positive cultures were obtained from the two-year-old prunings. The disintegration of these would give rise to new bacterial infection in the underlying soil.

Results of Further Study of the Organism.

These results made further study necessary. A series of twenty pots was set up, each pot containing a two-year-old Sultana vine on its own roots. The soil of each pot was treated with suspensions of bacteria at seven-day intervals to ensure a heavy concentration surrounding the roots. The plants were inspected regularly and at the end of November one plant showed signs of the disease. The new growth was sickly and spots appeared on leaves of a shoot growing about ground level. The cutting was taken up and examined. Bacteria were recovered from the portion just below ground level but not from the extreme base of the original cutting. Two thick roots and several thin ones from about two inches below soil level were tested and bacteria were recovered from these. This vine had been in an unthrifty state following an attack of anthracnose and this probably explains the great susceptibility it showed. The remaining vines have not yet shown definite symptoms of the disease, but the treatment will be continued at the beginning of the next growing season when other positive results may be obtained.

A further group of Sultana vines was used with a different treatment. Here the ends of the roots were allowed to dip into suspensions of the bacteria. These vines have not yet shown any external signs of the disease, but they are not making very good progress and may develop lesions on the next year's growth. The

period so far occupied by this work has been too short for any negative results to be of value and the investigation must be continued over a period of at least three years.

Isolation of the Organism from the Soil.

At the same time attention was given to the isolation of the organism from the soil itself. This was no simple matter as the other soil bacteria tended to grow so fast that the causal agent of "vlamsiekte" was lost. By using dyes which inhibited these bacteria it was possible to isolate the group to which *Erwinia vitivora* belongs, and many cultures were obtained. Eleven of these produced the disease in healthy vines, while the rest were closely related to *Erwinia vitivora* but were not pathogenic to vines. These successful isolations were from three sources, namely, an infected vineyard at Constantia, another at Banhoek, and a pot of artificially infected soil.

Danger of using Infected Grape Residues.

The possibility that the use of grape residues from wineries as manure could carry active bacteria to uninfected vineyards led to investigations being made into the presence of dangerous bacteria in this material. The skins, residues and stripped stalks of several varieties of grapes were obtained from two wineries at Constantia. From both these sources positive isolations were made. Further samples of skins were divided into two lots and dried in two different ways, namely, in shade and in bright sunlight. Active bacteria were obtained with ease from the shade-dried material and also from the under layers of the sun-dried material. The upper layers which were exposed to direct sunlight did not yield positive isolates. Drying the stalks for periods up to nine weeks made no difference to the yield of positive cultures. Heating the material to temperatures above 55° C. did destroy the bacteria, but this treatment would be difficult and costly where large quantities of material have to be dealt with.

The progress of this work so far shows clearly that the organism *Erwinia vitivora* in soil is a potential danger for infection, because, although the proportion of vines affected may be very small, when a vine becomes so infected and the disease reaches the aerial shoot, the infection may quickly be spread through the whole vineyard by cultural and pruning operations. The danger from the use of pomace (grape residues) is also real and is not lessened by air-drying or keeping the material for several months before use. Further work is necessary before the seriousness of the position can be evaluated, but this preliminary work shows that the possibility of soil-borne infection cannot be overlooked.

IMPORTANT NOTICE.

Will persons who place orders for vaccines please note that:—

- (a) No refund of the purchase price or credit will be made if purchasers return the vaccine to the Department.
- (b) Such returned vaccine will always be destroyed.

Ask for Price List of Laboratory Products and note the correct addresses.

The Litchi in South Africa.*

I.—Varieties and Propagation.

Dr. Raimund H. Marloth, Officer-in-Charge, Subtropical Horticultural Research Station, Nelspruit, Eastern Transvaal.

AMONG the many delicious subtropical and tropical fruits of the Orient gradually becoming better known to the Western World is the Litchi. This delicacy of former Chinese Emperors is being grown successfully on an increasing commercial scale in South Africa, and the heavy supplies of fruit expected from new plantings coming into bearing will enable persons of moderate means to emulate the poet Su Tung Po, who, during his exile, consoled himself with a mere 300 fruits per day.

A native of South China, the litchi † is to-day found growing commercially in such widely separated countries with a subtropical climate as India, Japan, Brazil, Australia, Madagascar, some of the West Indies, Hawaii, Florida, and South Africa. In China, as in the past few thousand years, it is still the most highly prized of fruits, and is grown extensively; even twenty-five years ago the annual crop of the Kwangtung Province alone was, according to Groff (1921), about 30 million pounds, worth £300,000.

Despite the many thousands of years during which the litchi provided a delicacy for the Chinese, it is only comparatively recently that it was introduced to the rest of the world. Hawaii received its first tree in 1873 and Florida in 1886. Davis (1928) quotes Ducasse as having found two trees about six years old in Natal in 1875, and these might be regarded as being the first introductions into South Africa. Later introductions were made about 1876 by Ducasse from Mauritius. From about 1886 onwards the Durban Botanical Gardens distributed layered trees of those Mauritius introductions within the Union, mainly for planting in Natal, the first coming to the Lowveld of the eastern Transvaal only in 1903.

The rapid increase in litchi planting in recent years in the Union is shown by the figures in the table below. While the coastal zone of Natal used to be the main centre of production, large orchards being found at Port Shepstone and at Verulam, it is in the eastern Transvaal Lowveld where the greatest extension of planting is now taking place. One estate planted 5,000 trees in 1946 and 1947 alone, while another estate already has 5,000 trees in bearing. It is doubtful if anywhere else in the world, even in China, there are individual orchards approaching such as these in size. Judging by the known present demand on nurserymen for trees, it would not be surprising if at least a further 30,000 trees were planted in the Union during the next ten years.

Botany.

Belonging to the family *Sapindaceae* are some extremely fine fruits, the best known of which is the litchi (*Litchi chinensis*, Sonn.). Groff (1943) maintains that the litchi, a genus in the sub-family *Nephelieae*, should be considered as being one of the few cultivated fruits which can essentially be considered an ecotype, notwith-

* An amplified revision of "The Litchi" by the same author, published in *Farming in South Africa*, November 1934, and issued as Reprint No. 94/34.

† Pronounced *ly-chee* in China and *leet-jee* in India, so that either pronunciation may be considered correct, although it would be preferable if only one pronunciation were used throughout the English-speaking world; apparently *ly-chee* is more commonly used, and in Florida, U.S.A., is actually also spelt lychee.

Litchi Trees in the Union. *

	Cape.	Natal.	Transvaal.	O.F.S.	Union.
1936					
Bearing.....	25	5,515	3,795	10	9,345
Non-Bearing.....	187	3,707	2,444	5	6,243
TOTAL.....	212	9,122	6,239	15	15,588
1937					
Bearing.....	50	6,263	5,855	—	12,168
Non-Bearing.....	274	3,572	2,177	—	6,023
TOTAL.....	324	9,835	8,032	—	18,191
1946					
Preliminary Approximation.					
Bearing.....	400	10,000	15,000	—	25,400
Non-Bearing.....	200	3,000	10,000	—	13,200
TOTAL.....	600	13,000	25,000	—	38,600

* Figures kindly supplied by the Director of Census and Statistics from the relative Agricultural Censuses. The figures for 1946 are based on returns from 11 Magisterial areas in the Union in which the main plantings are known to be, compared with returns for the same areas in 1937.

standing the existence of another species, *Litchi philippinensis*, found wild in the Philippines.

Lesser known but equal in eating quality are the rambutan (*Nephelium lappaceum*, L.) and the pulasan (Bulala) (*N. mutabile* Bl.), both of which are illustrated and described by Ochse (1931). These, however, are more tropical in their climatic requirements, being at home in Java and the Malay Archipelago, and it is doubtful if they would thrive anywhere in the Union. The longan (*Euphoria longana*, Lem.) closely resembles the litchi, but the fruit is smaller and of inferior flavour; it is hardier than the other mentioned fruits, and might have some value as a stock for its more finely flavoured but not so hardy relatives.

The litchi is an evergreen tree with extreme pinnate leaves. It attains heights up to 40 feet. The small and insignificant individual flowers are borne in great abundance in terminal panicles up to one foot in length. The petalless individual flowers are small and insignificant, and may be male, female, or both; It has been observed that when a great preponderance of male flowers is produced, the resulting crop of fruits is light. No record is available as to what factors influence the relative amounts of male and female flowers, this ratio differing on the same tree from year to year.

The fruit of the litchi is produced in loose clusters or bunches of from as few as two fruits to thirty or more per bunch. The individual fruit is oval to ovate in shape and up to 1½ inches in diameter, the size depending on the variety and on the conditions under which the fruit is grown. Trees bearing 1,000 lb. of fruit have been reported, but good sized trees over 30 years old and well cared for should at least average 250 lb. of fruit per annum.

The shell of the fruit has small conical protuberances on small scale-like areas; it is fleshy but thin, and grades in colour from pale green to bright rose-doree red when ripe on the tree, depending on variety, becoming very brittle and dull brown to dark reddish-brown

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soon after being picked or when the fruit dries on the tree. The pearl-coloured flesh or aril which surrounds the seed has the texture of a firm grape, and its pleasant sub-acid flavour has been likened by various writers to that of a Bigarreau cherry, a Muscat grape, or a white Malaga grape.

Varieties.

Although the litchi, as with all other kinds of fruit which have been long in cultivation, has numerous distinct varieties, only one variety or type is known commercially in South Africa. This is the Mauritius, so named here because practically all the trees throughout the country are descendants of a few original importations some 60 years ago. The fruit of this type is of medium size, almost roundish globular but slightly elongated, and has a smooth light brown to reddish-brown shell when mature; the slightly tough flesh surrounds a medium-sized pip, and is of good eating quality.



FIG. 1.—Layered litchi tree, 28 years old, in full blossom. Note spread of branches.

Groff (1921), the world's leading authority on the litchi, in his book on the litchi, lists 49 varieties and describes many of the best in detail; this information is supplemented by a description of 15 choice Chinese varieties by Higgins (1917). No reference can be found to descriptions of Indian varieties, but many of the best of these appear to be identical with some Chinese varieties. Many trees of different varieties from China and India have been imported into the Union, but the mortality was heavy, and thus there are comparatively few trees of varieties other than the Mauritius type alive to-day. At Lowe's Orchards, Southport, Natal, there is an orchard of some 16 Indian varieties imported in 1928, but unfortunately it has not been possible as yet to name the individual varieties correctly, confusion having arisen in the records after planting. At the Subtropical Horticultural Research Station,

Nelspruit, a Litchi Variety Orchard was planted in 1940, consisting of some 26 varieties and types, including trees from China, India, and Formosa. In these countries such fruit characteristics as late or early maturing, regular or annual heavy or light setting, size of individual fruits, size of seed, and eating quality as influenced by flesh texture and its sugar and acid content, determine the desirability of different varieties for commercial plantings. It will be several years still before the varietal studies in hand in the Union will have progressed sufficiently before varieties other than the present Mauritius type can be recommended for planting and then the initial difficulty will be to obtain nursery trees thereof in sufficient quantity. Thus far the varieties have been classed arbitrarily into three distinct types:— the *Mauritius* as at present grown in the Union and including the remarkably fine quality with relatively small seed Haak-Ip variety which under Lowveld conditions appears to be a shy bearer; the *Madras* which bears heavy crops of large highly coloured red fruit with prominent protuberances and relatively large seed, but which has a melting flesh high in sugar content; and the *Chinese*, of which the Glutinous Rice and Shang Shou Haui with their small rounded fruit of good quality having relatively small seeds are representatives.

Despite certain varieties being called "seedless", such as the Bedana and the Short's Seedless in India and the No Mai and the Kuei-wei in China, this is only a relative term, and should not lead growers to believe that litchi varieties without any seed at all are being grown. The immaturity of seeds, termed "chicken-tongued" by the Chinese, which occurs in some varieties, is a much valued character of the litchi when grown commercially. Groff (1943) records that this desirable character is also appearing in some trees of the "Fukien Brewster" variety in Florida, U.S.A., although no definite strain of a "seedless" Brewster has as yet been isolated and vegetatively propagated. The possibility of obtaining a "seedless" strain of the Mauritius in South Africa offers great possibilities. Growers are urged to examine their trees year after year with a view to finding such desirable tree or branch sports. It has been noted that the individual fruits of the Mauritius which differ from others by having broad flat shoulders and being squatter than the normal oval-shaped fruit, usually have "chicken-tongued" seeds.

Popenoe (1927) lists the requirements for best tree growth and fruiting of the litchi thus: (1) freedom from injurious frosts; (2) a humid atmosphere; (3) a deep loamy soil; (4) an abundance of soil moisture. Groff (1943) gives the first requirement of the litchi as being moist heat in summer, and the second as cool non-freezing winters, preferably on the dry side. However, periodic cold snaps in winter between 30° and 40° F. are essential to give the litchi the physiological changes necessary for fruit-bearing.

While being really a subtropical tree, the litchi thrives best where there is a total absence of frost. Young trees are most sensitive to even one degree of frost, and trees six years old have been killed to the ground at 26° F. in Florida, U.S.A. Higgins (1917) reports that older trees have been known to stand 11° of frost for a short period without suffering serious damage. Evergreen trees growing without a marked dormancy period, like the litchi, are liable to be injured by temperatures below freezing, even though exposure be for only a few hours. Seasonal variations in temperature are necessary for best fruiting, for it was noted in Java and at Mombasa by the writer that while the trees grew excellently under the tropical

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conditions existing on the equator where winter and summer minimum temperatures did not differ greatly, it was only in occasional years that the trees flowered and set fruit, and then only in limited quantities.

The litchi needs plenty of water from both above and below. However, the moisture from above should be in the form of humidity all the year round and not so much in the form of prolonged rains during restricted seasons. This is particularly the case during the flowering period (August-September) for then normal pollination of the flowers is interfered with. After the fruit has set, there will be a considerable fruit drop at first and bursting of fruits when maturing in size if periods of dry atmospheric conditions followed by alternating rains prevail. This bursting of fruits is the cause of heavy losses to commercial growers in some years in the eastern Transvaal. Groff (1943) unhesitatingly ascribes the bursting of

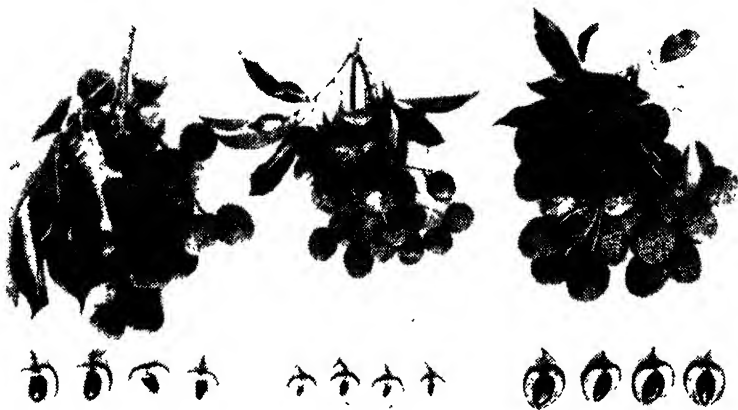


FIG. 2.—Bunches of litchi fruits. Mauritius type on left, Madras type on right, and the Shang Shou Haui variety in centre. Note relative sizes of seeds as shown in cross-sections of fruit.

fruits, which is inherent within the family to which the litchi belongs, to the absence of sufficient moisture in the atmosphere, particularly during the late spring and summer months. In Canton, day and night humidities of between 80 and 90 during these months are ideal for best fruit-bearing, while in California it has been found that hot dry desert winds during this period are the greatest detriment to litchi production. Ample soil moisture during this period should offset to some degree this harmful effect of dry atmospheric conditions.

Although a deep loamy soil is most preferred for the litchi, the tree gives satisfactory performance on many soil types, provided that there is sufficient depth and they are well drained. Trees planted on an acid soil make much more vigorous growth than those on neutral or slightly alkaline soils. "Brak" or saline soils are unsuited for litchi growing. Coville has shown that the litchi is a mycorrhizal plant, which means that there is a fungus growing on the roots of the tree to the mutual advantage of both the litchi and the fungus. Soils which are high in organic content, well aerated, and which do not dry out easily, provide an excellent growing medium for this fungus, with consequent better root-growth of the litchi.

A favourite situation for the Chinese to plant their litchi trees is on dykes between rice fields and on banks of streams. This ensures that the roots of the tree always have access to an abundance of water right throughout the year, particularly from time of flower-bud differentiation (May-June in South Africa) to fruit harvest (December-January in South Africa). However, it is essential, first, that this underground supply of water be moving, for stagnant water results in rotting of roots, and secondly, that the surface of such water be at least three feet below the soil surface, in which well aerated moist zone the abundance of surface feeding roots of the tree can thrive. Conditions such as the foregoing are to be found in relatively few and restricted instances in areas suited to litchi growing, and therefore it is necessary to have available during most of the year a sufficient amount of irrigation water to supplement the natural rainfall.

Propagation.

As with all fruit trees grown commercially, the litchi is propagated by vegetative means in order to ensure that the young trees are the same as the parents and that uniformity is maintained throughout the nursery and orchard. Litchi seedlings show the greatest variability not only in tree characters but also in the fruit produced later. In only very few instances do seedlings produce fruit equal to that of the selected and named parent varieties. The greatest disadvantage of planting seedling litchi trees is that they take so long to come into bearing; in Hawaii a tree 30 feet high and over 20 years old had never produced a flower, while in the eastern Transvaal seedling trees over 15 years old fail to produce even a hundred fruits per year.

The centuries-old method of litchi propagation by means of air-layering (gootee, gothee, marcotting, mossing) is still the only one used throughout the world by commercial nurserymen. As the references given with this article deal exhaustively with the propagation of the litchi, only the essentials of the process will be given here. Practical experience helps much to ensure the highest percentage of success, but actually the process is relatively simple and can be performed successfully by the amateur.

Air-layering is done on well-grown parent trees. At the beginning of the season of most active growth, which is about August in South Africa, branches about the thickness of a man's little finger, from $\frac{3}{8}$ to $\frac{5}{8}$ of an inch in diameter, are selected on the outer perimeter of the tree. A tendency on the part of nurserymen in recent years to utilize branchlets of pencil thickness or less, thereby enabling them to "set" double or more the number of marcottes per tree without reducing the top growth and consequent fruit crop unduly, has been noticed. The use of too thin branches results in a smaller tree than would seem desirable being supplied to growers, and may delay first fruiting by at least a year. At about 18 inches from the tip of the branch to be layered a 1-inch ring of bark is removed. It has been found at the Nelspruit Station that better rooting results if the exposed area, particularly the cut edge of the remaining bark, is treated with growth-promoting substances such as indole-acetic acid. (Named proprietary products are for sale in South Africa). Although not essential, many propagators leave the exposed portion to dry out for one or two days before applying any packing, and others also give the branch a twist in such a manner as to rupture the wood

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at the area where the bark has been removed. A ball of sphagnum moss mixed with clay or of very loamy earth is then applied around the cut zone, and the whole wrapped with several layers of sacking and tied fast. The amount of earth or moss used should not be too little, the final packing measuring at least 6 inches in diameter and extending at least 5 inches below and 3 inches above the cut zone. Better and more uniform rooting will result if the leafy end of the branch is so tied as to be higher than the cut portion where roots are to form; actually, the nearer to the vertical the branch is kept



FIG. 3.—Air-layers or marcottes in position. Note strings leading from water-container to keep marcottes moist. Marcottes horizontal instead of upright.

the better it is. The ball is kept constantly moist by means of an oakum or fibre string led from a hole in the bottom of a container of water which is suspended above the marcotte and regularly re-filled.

In four to six months rootlets should be seen appearing through the sacking. The branchlet should first be defoliated by 75 per cent. either through removal of that proportion of whole leaves or by cutting three-quarters of individual leaves. The marcotte is then

severed from the parent tree without disturbing the packing, and the whole planted in paraffin tins cut in half and containing soil which has been gathered from underneath old litchi trees, thus ensuring that the mychorizal fungus establishes itself early in the roots of the newly propagated tree. The tinned trees should be kept in a lath-house and watered regularly until new growth is made and has hardened. After gradual exposure to the full sun out in the open the trees are ready for planting in the orchard.

Pope and Storey (1933) have followed up the work of Higgins on the grafting of the litchi on its botanical relative, the longan. Longan seedlings are easily raised, for unlike the litchi seed which is very short-lived and must be planted within a few days after removal from the fruit, the longan seed retains its viability reasonably well. If the side-tongue method of grafting is used, a 60 per cent. take should be obtained. Whether such a grafted tree is in any way superior to a layered tree has not yet been shown; in areas susceptible to frost the hardiness of the longan stock should be an undoubted advantage. Grafted trees, like layered trees, also have the advantage of being true to the parent type, and of coming early into bearing. As far as is known, there are no grafted or budded litchi trees in the Union, either on longan or litchi stock; considering the advantage in ease of propagation and convenience in nursery practice, nurserymen would undoubtedly discard the air-layering method of vegetative propagation in favour of budding or grafting if the technique of these latter methods could be so improved as to ensure that a reasonable "take" is obtained.

(In a following article, cultural practices and marketing will be dealt with.)

The Drakensberger :—

[Continued from page 794.]

Recommendations.

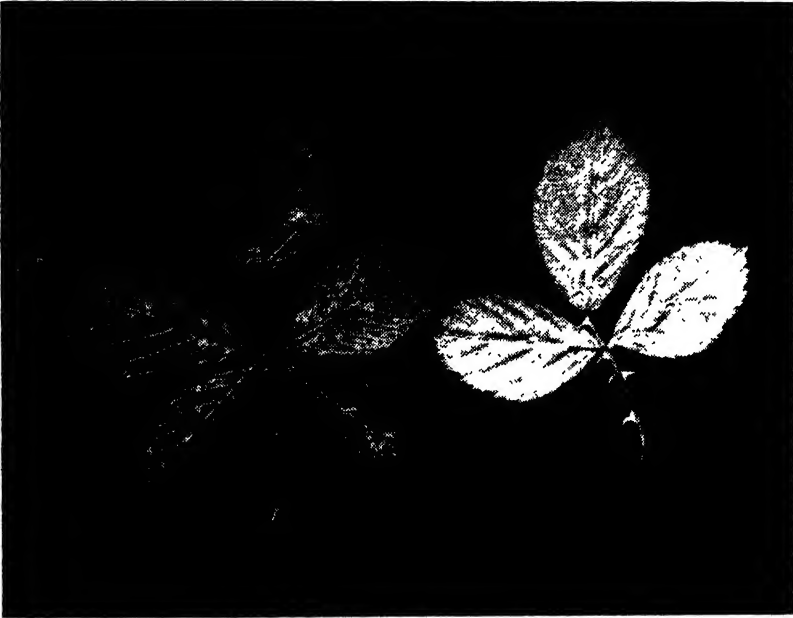
The Committee feels, therefore, that there are very good reasons for an investigation of the potential value of indigenous breeding material with a view to its utilization in combating the livestock problems mentioned above, especially in areas where conditions are less favourable to the imported breeds. It therefore recommends that:—

- (a) an inter-departmental committee be appointed as soon as possible to make a survey of the available indigenous breeding material;
- (b) "pure-bred" herds of such animals be established for improvement; and
- (c) research work be carried out to determine to what extent the characteristics of such animals could contribute to the development of types suitable for certain conditions and areas.

Can Rust Kill the Bramble?

Dr. Vincent A. Wager, Officer-in-Charge, Botanical Station,
Durban.

RECENTLY numerous enquiries have been received concerning a disease on the American Bramble. This bramble (*Rubus fruticosus* var. *Bergii* Ch. & Sch.) is a serious pest in the midlands of Natal and has spread during the last few years with such rapidity that large areas of farm land have had to be abandoned.* Many methods of exterminating the pest have been tried but none has proved very successful, for any portions of the plant left in the soil will shoot up the following year. A disease that would destroy the plant would indeed be welcome.



[Photo by V. A. Wager.]

The illustration shows a healthy American Bramble leaf on the right and one infected with rust on the left.

Such a disease, called rust, caused by the fungus *Kuehneola albida* (Kuehn), has been recorded during the past few years, and in January, 1947, it was reported in the Richmond area to have defoliated and killed the plants, almost completely clearing one farm. In April of this year the writer saw a patch of bramble in the Boston area some ten yards in diameter that had apparently been killed by the disease, for nothing but the stalks of the plants remained, and all the leaves, which had dropped off, were found to be completely covered with the fungus. It is not known, however, whether such plants will recover and shoot up again next year.

* In *Farming in South Africa*, October 1946, page 647, it is stated that the American Bramble has virtually rendered 20,000 acres unproductive in Natal

The disease has been seen in the Richmond, Boston and Nottingham Road areas, but a survey would probably show that it was more wide-spread.

Appearance of Infected Plants.

Rust can be very readily identified on the plants, for the undersides of the leaves become covered with pin-point dots of golden powder. These dots can be so numerous that the leaf has a golden powdery appearance. This powder comes off readily if a leaf is tapped on the hand or a piece of paper, and is composed of myriads of spores of the fungus. The upper sides of infected leaves are usually reddish or purple, reminiscent of autumn tints. When a spore falls on a young leaf it germinates, sending out a tube which enters and lives within the leaf tissue and finally erupts a mass of spores.

Artificial Spread of the Disease.

The life history of a rust fungus is a complicated affair and often requires two different varieties of host plants. No secondary host has, so far, been discovered for this particular rust, so that it seems very possible that the fungus will spread from one bramble plant to another.

In Durban experiments have been carried out during the past few years to develop a rust-resistant Antirrhinum or Snapdragon. Rust spores were repeatedly sprayed on the plants so that susceptible varieties rapidly became severely infected with the disease, whereas resistant varieties remained healthy. It would be a simple matter to try and infect brambles in the same manner. All that is necessary is to collect a few branches of bramble plants whose leaves are covered with the golden powder and put them in a bucket of water. Stir them up briskly for about ten minutes, then remove and keep them for a repeat performance the next day. The water, which would then contain millions of fungus spores, is simply sprayed on to a healthy patch of bramble, preferably in the late afternoon or during rainy weather.

There is no guarantee that the disease will spread in this manner, nor that it will destroy and possibly eradicate this pest, for, although the leaves may be killed, the plant may shoot up the next year. But it is worth trying and already three farmers have experimented along these lines. Their efforts, and the spread of the disease, will be watched with interest.

Varieties of Bramble.

It is said that this bramble was introduced from America by a farmer near Mooi River some forty years ago to produce berries for jam making. When the berries are eaten by birds, the undigested seeds fall and start new bramble thickets along fences, under isolated trees and under telephone wires, and the plant has thus spread far and wide.

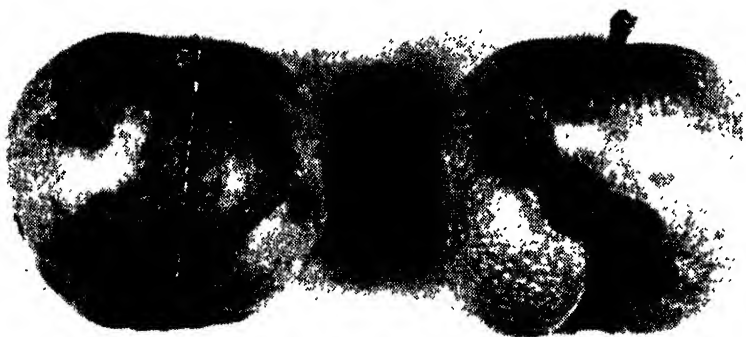
There are four other species of bramble which are native to Natal and Zululand. These differ slightly from one another and from the American Bramble and it is not yet known whether this rust disease will attack them as well.

Fusicladium of Apples.

III.—A Few Factors Affecting the Incidence of the Disease.

Dr. A. J. Louw, Western Province Fruit Research Station.

IT is common knowledge that rainy weather during the growing season of apple trees is conducive to the development of *Fusicladium* (or apple scab). Wet conditions during the period of foliation of the tree enable the causal fungus to establish itself during the early development of the blossoms, a phenomenon which is of special importance in the epidemic development of the disease, since it makes for an earlier development of the secondary source of infestation (the summer spores). The earlier the formation of the secondary source of infestation in relation to the seasonal development of the tree, the greater are the chances for the development of epidemic conditions, since the susceptibility of the leaves decreases with age.



Apple infected with *Fusicladium*. Such severe infection is the result of calyx-infections.

Infections occurring during the blossoming stage, also have a much more detrimental effect on the fruit than infections occurring *after* the formation of the fruit. It is in the blossoming stage that infections occur at the calyx end of the fruit. Such scab spots at the calyx end of the fruit are most favourably situated for the dispersion of the spores over the surface of the developing fruit by rain or dew. It is for this reason that fruits of which the calyx area is infected are usually totally deformed and unusable (see illustration).

Weather conditions during the growing season of the apple tree are, however, not the only factors bearing on the incidence of the disease. In a previous article (*Farming in South Africa*, August, 1947) it was pointed out that the first outbreak of *Fusicladium* each

year originates from the winter spores which develop in old infected leaves lying on the ground. It is therefore understandable that conditions prevailing during the previous autumn and winter months, which affect the formation of these spores, will also exercise an influence on the disease during the following season.

Leaf Drop during Autumn.

The dropping of infected leaves from the tree is a prerequisite for the formation of the overwintering phase of the *Fusicladium* fungus. This development of the fungus cannot occur in living leaves. The earlier the leaves drop from the trees the earlier this development can set in and the earlier the winter spores of the fungus will mature. It is thus possible that an early winter will cause the winter spores to mature so early that they will be liberated into the air even before the apple trees have foliated. This phenomenon may occur in such a degree that practically the whole supply of winter spores may be exhausted before the apple trees foliate, with the result that there will no longer be any primary source of infection. In such a case the disease will occur either very lightly or not at all.

When the leaves drop naturally, i.e. with the advent of the cold weather, the prevailing humidity and temperature conditions are usually favourable to the development of the overwintering phase. As a result of drought conditions or of certain orchard practices, an untimely leaf-drop may, however, occur.

In localities in which irrigation is inadequate, it sometimes happens that apple trees shed their leaves during February and March, or even earlier. During the period 1939-41 this condition occurred very generally throughout the winter-rainfall area as a result of spraying with arsenate of lead under unfavourable climatic and growing conditions. During these years it was a very common sight to see certain apple varieties leafless long before the harvesting of the fruit. Leaves dropping so prematurely are exposed to very dry conditions for a time after landing on the ground. According to experimental data, the *Fusicladium* fungus cannot survive such dry conditions. Early dropping of the leaves during the dry period of the year will thus severely restrict the source of infection during the subsequent year. Various cases have been observed in which orchards exposed to conditions conducive to untimely leaf-drop or leaf-scorch were not attacked by *Fusicladium*, whereas neighbouring orchards which experienced a normal drop were severely infected by epidemic outbreaks of the disease. During the past few years arsenate of lead, as a spray, has to a large extent been superseded by "fixed" nicotine, with a resultant marked improvement in the condition of trees generally, apple trees showing a definite tendency to retain their leaves until the onset of wintry conditions. This leads to normal maturing and dropping of the leaves and a normal development of the overwintering stage of the *Fusicladium* fungus. It is quite possible that these factors have contributed much toward the more serious incidence of *Fusicladium* epidemics during the past few years.

Humidity Conditions during Winter.

After the leaves have fallen to the ground, moisture is indispensable to the development of the overwintering phase for which even the nightly precipitation of dew is sufficient. It is unlikely that humidity conditions in the winter-rainfall area during winter will

FUSICLADIUM OF APPLES.

be so inadequate as to limit to any serious extent the development of the overwintering phase. There are, however, certain areas in the Union which do not experience any winter rain and where, in addition, the atmospheric humidity is very low during the winter months. The almost total absence of *Fusicladium* in these areas may possibly be due to insufficient wetting of the leaves during the winter.

Investigations on this aspect of the overwintering of the *Fusicladium* fungus have further revealed that the development of the winter stage is much delayed if the old leaves are exposed to excessive moisture. During the winter months marshy conditions often occur in some apple orchards, with the result that the overwintering apple leaves are totally submerged in water. Where leaves lie in such damp spots and in water furrows in the orchard, the development of the fungus during winter is seriously delayed. It is possible that the maturing of most of the winter spores may occur only after the foliation of the apple trees—at a stage when a fairly large leaf surface is already exposed to infection. This mainly accounts for the fact that trees growing in damp spots in orchards are more liable to the disease.

Temperature Conditions during Winter.

The development of the first stages of the overwintering phase of *Fusicladium* occurs best at a relatively low temperature (7° to 13° C.). As the development progresses warmer weather is, however, required and the most suitable temperature for the final stage, namely the maturing of the winter spores, is more or less 20° C. If the winter temperatures are relatively warm during the early stages of development, the progress may be extremely slow and the number of winter fruit bodies formed very limited. Cold weather immediately after the drop of the leaves is, therefore, conducive to the formation of a large primary source of infection for the following season. On the other hand, warm weather during the final stages of development may accelerate the maturation of the winter spores to such an extent as to induce their liberation into the air in winter, i.e. even before the foliation of the apple trees.

Observations on the development of the overwintering phase of *Fusicladium* in conjunction with the incidence of the disease in various localities of the winter-rainfall area and during different seasons has emphasized the dominating influence of winter temperatures on the epidemiology of the disease. In 1942, when a severe outbreak of the disease occurred in Ceres, low temperatures during the later stages of development of the overwintering phase much delayed the maturing of the winter spores. The winter spores were mostly liberated only after the foliation of the trees, and consequently primary infections could occur on an extensive scale. In Elgin, where the winter temperatures are appreciably higher, the winter spores mature and are liberated into the air long before the foliation of the apple trees. At the time when the blossoms of apple trees open, the supply of winter spores has decreased to such an extent that very little primary infection occurs. This explains why the disease is, as a rule, less severe in Elgin than in Ceres.

The influence of winter temperatures on the epidemiology of *Fusicladium* in the winter-rainfall area can be traced still further. It is known that warm winters are the cause of the phenomenon of

"delayed foliation" in fruit trees. Not only is there an earlier maturing of the winter spores of *Fusicladium* during such years of delayed foliation, but also a later foliation of apple trees, so that the winter spore liberations in such circumstances either do not coincide with the susceptible period of the apple tree or, if they do, to a slight extent only. Localities enjoying mild winters, such as, for example, Paarl, Stellenbosch and Villiersdorp, are seldom subject to *Fusicladium*, although the spring weather conditions of these areas are, as a rule, very wet and consequently also favourable to the disease. It would therefore appear that high winter temperatures are responsible for the relative absence of *Fusicladium* in these districts.

Moreover, winter temperatures also seem to explain to a large extent the variation in the severity of *Fusicladium* from year to year. It is noteworthy that during the years in which this study was made (1940-1945), the only severe outbreak in Elgin occurred during the 1943-44 season, when the average daily temperature for the months June to August was the lowest for that period. It is further remarkable that correspondence notes indicate that the number of enquiries in regard to *Fusicladium* during that season far exceeded those during the period 1939-45. Mention has already been made of the increase in the incidence of *Fusicladium* during the past few years. For at least a few years before 1941 the disease occurred on a very limited scale in the Western Cape Province. For the years prior to 1938 practically no information on the incidence of the disease is available. The older apple growers in Elgin can, however, still recollect the very severe *Fusicladium* epidemics during the years 1918-19. According to Putterill (*Agricultural Journal*, Union of South Africa, 1921), it was also about that time that the disease first occurred on an epidemic scale in Franschhoek, although the disease had been observed there as early as the 1914-15 season.

These known periods of severe outbreaks of *Fusicladium* seem to coincide with periods of relatively low winter temperatures. According to de Villiers (*Farming in South Africa*, August, 1947) the present period of low winter temperatures set in more or less in 1941, whereas the winters of 1937 to 1941 were mild, in consequence of which deciduous fruit trees suffered severely as a result of delayed foliation. The winters of 1918 and 1919 again were relatively cold, as appears from the meteorological data of the Royal Observatory, Capetown. Thus, there appears to be a positive correlation between cold winters and the severity of *Fusicladium* epidemics in the winter-rainfall area.

Conclusion.

The effect of the above factors on the incidence of *Fusicladium* provides a basis for gauging in advance the expected severity of the disease in any particular season. The collection of the necessary data will make it possible for growers to be warned of the localities where severe outbreaks of the disease are likely to occur. In addition to the usual sprays, special measures of control can be taken. The nature of such special measures of control will be dealt with in a subsequent article.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26

October 1947

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Price Review for August, 1947.*

Fruit.—The markets were fairly well supplied with apples, pineapples, bananas and papaws. On the Johannesburg market prices for apples increased from 17s. 10d. to 20s. 1d. per bushel box; for avocados from 5s. 2d. to 5s. 7d. per tray; and for pineapples from 4s. 3d. to 5s. 2d. per dozen.

Tomatoes.—In Durban, satisfactory consignments were received from the Transvaal to augment the dwindling Natal supplies. Prices increased from 3s. 8d. to 3s. 10d. per tray on the Johannesburg market and from 2s. 3d. to 2s. 9d. on the Cape Town market, but on the Durban market prices decreased from 1s. 9d. to 1s. 3d.

Onions.—Supplies, which were of good quality, were inadequate in Durban. In Cape Town, however, supplies increased. On the Johannesburg market prices increased from 31s. 5d. to 32s. 7d. per bag; on the Cape Town market from 25s. 2d. to 40s. 2d.; and on the Durban market from 32s. 2d. to 40s. 4d.

Potatoes.—Supplies remained firm and increased in some cases. On the Johannesburg market prices decreased from 16s. 11d. to 16s. 2d. per bag for Grade I, from 12s. 5d. to 10s. 5d. for Grade II and from 7s. 11d. to 6s. 5d. for Grade III; on the Durban market from 20s. 1d. to 16s. 7d. for Natal potatoes and from 19s. 4d. to 16s. 3d. for Orange Free State potatoes; and on the Cape Town market from 22s. 11d. to 21s. 6d. Prices on the latter market for Transvaal potatoes increased from 18s. to 20s. 10d. per bag.

* All prices mentioned are averages.

Vegetables.—Cabbages were well supplied on the Johannesburg and Durban markets, but the supply of cauliflower on the Johannesburg market decreased sharply. Green beans and green peas were scarce and prices high. The Johannesburg market was well supplied with pumpkins and carrots. The prices of green beans increased from 6s. to 10s. 2d. per pocket on the Johannesburg market and from 4s. 6d. to 9s. 1d. on the Cape Town market. The prices of cabbages decreased from 6s. to 4s. 1d. per bag on the Johannesburg market, and from 7s. to 5s. 5d. on the Durban market, but increased from 6s. 9d. to 7s. 3d. on the Cape Town market.

Seeds, Grain and Fodder.—Supplies of dry beans and kaffircorn were small, and sales were firm on the Johannesburg and Durban markets. The price of lucerne decreased from 7s. 1d. to 6s. 5d. per 100 lb. on the Johannesburg market for Transvaal lucerne, but increased from 6s. 9d. to 8s. 4d. on the Cape Town market. The price of kaffircorn increased from 30s. 5d. to 32s. 7d. per bag.

Eggs and Poultry.—With a rather sudden improvement in the supply position on the Durban market, prices were generally well below the maximum prices published in the *Government Gazette*. Eggs were well supplied on the Johannesburg and Cape Town markets. Fair supplies of fowls were marketed on the Johannesburg and Durban markets.

Agricultural Conditions in the Union During August, 1947.

Weather conditions.—Very little rain fell in the Union during the past month. Good showers occurred in the western and south-western Cape Province. No rain occurred in the north-western Cape Province, but the Karoo and the south-eastern Cape Province had light showers. Scattered showers occurred in the Transkei, but in the Border area the precipitation was less. Natal had light showers. No rain fell in the Transvaal and Orange Free State.

The number of drought-stricken districts totalled 58 in the Cape Province, 2 in Natal, 5 in the Transvaal and 24 in the Orange Free State.

Crops.—The summer crops were above expectation. The prospects for a fair grain crop in the western and south-western Cape Province improved. In the Transkei good summer crops were harvested. In Natal more rain was needed for the sugar-cane crop which was promising.

On the Transvaal highveld the summer crops were of average quality and quantity. Due to the continuous drought, summer crops in the northern part and in the lowveld of the Transvaal were poorer than usual. As a result of the drought in the western Transvaal the prospects for winter cereals deteriorated. The crops were generally below expectation.

In the north-eastern Orange Free State bumper summer crops were harvested and the wheat which was sown was particularly promising. In the western and the south-western Orange Free State summer crops were very poor. The crops in the north-western Orange Free State were, however, more satisfactory.

Stock and Pastures.—In the western and south-western Cape Province stock diseases were quiet. Stock losses occurred in the Border area as a result of the deteriorating pastures. In the Transkei cases of lumpy skin disease still occurred. The showers

CROPS AND MARKETS.

which occurred in Natal were not sufficient to improve the pastures. Nagana and lumpy skin disease increased further and losses were caused by the former.

As a result of the warmer weather on the Transvaal highveld the condition of stock did not deteriorate. In the northern part as well as in the lowveld of the Transvaal the condition of the stock was poor, and anthrax occurred. The condition of stock in the western Transvaal also deteriorated, and cases of anthrax occurred. All cases of anthrax in the Union were, however, under control.

Stock in the north-eastern Orange Free State was still in a reasonably good condition, but in the western Orange Free State the drought caused stock losses.

Index of Prices of Field Crops and Pastoral Products.

This index (see table elsewhere in this issue) remained unchanged for August, viz. at 200. The following are the most important changes which occurred:—

- (a) *Other Field Crops* (i.e. potatoes, sweet potatoes, onions and dried beans) which decreased from 216 in July to 213 in August, as a result of the decrease in the market prices of potatoes and sweet potatoes.
- (b) *Slaughter Stock* (i.e. cattle, sheep and pigs) which increased from 191 in July to 196 in August, as a result of a further increase in the seasonal prices of slaughter cattle.
- (c) *Poultry and Poultry Products* (i.e. eggs, fowls and turkeys) which decreased from 207 in July to 188 in August as a result of the decrease in the market prices of eggs and fowls.

Maximum Prices of Eggs.

The maximum wholesale and retail prices of eggs in controlled areas, as fixed on 18th July, 1947, were decreased by 3d. per dozen for all grades as from 5th September, 1947.

Prices are now as follows:—

Description of Eggs.	Maximum Prices per Dozen	
	Wholesale.	Retail.
Grade I—	s. d.	s. d.
(a) Large.....	1 9	2 0
(b) Medium.....	1 7	1 10
(c) Small.....	1 5	1 8
Grade II		
(a) Large.....	1 7	1 10
(b) Medium.....	1 5	1 8
(c) Small.....	1 3	1 6
Grade III—		
Mixed.....	1 4	1 4

See *Government Gazette Extraordinary* of 5 September, 1947.

The maximum price of eggs in the uncontrolled areas has been fixed at 1s. 9d. per dozen as from 5 September, 1947. See *Government Gazette Extraordinary* of 5 September, 1947.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and poultry products.	Com- bined index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
WEIGHTS.	19	13	2	3	84	6	17	6	100
1938-39.....	92	109	96	89	79	102	106	94	93
1939-40.....	86	114	77	95	115	105	106	89	104
1940-41.....	108	120	106	156	102	108	110	103	109
1941-42.....	120	144	143	203	102	181	185	186	124
1942-43.....	160	157	144	159	122	147	168	167	147
1943-44.....	170	186	137	212	122	154	185	188	159
1944-45.....	183	186	160	281	122	177	179	184	164
1945-46.....	201	194	164	312	118	198	185	170	170
1946-47.....	241	209	149	232	169	205	192	204	198
1946—									
January.....	198	194	191	347	118	204	188	204	174
February.....	198	194	158	305	118	186	184	224	171
March.....	198	194	160	280	118	186	181	241	171
April.....	198	194	176	298	118	186	180	270	174
May.....	249	194	170	284	119	186	177	239	184
June.....	246	194	178	287	119	218	178	280	184
July.....	245	194	182	303	120	231	183	198	182
August.....	242	194	181	319	120	231	188	164	181
September.....	243	194	183	351	163	231	196	156	198
October.....	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December.....	242	210	157	236	168	194	208	201	200
1947—									
January.....	242	210	144	174	178	194	200	238	202
February.....	240	210	127	157	187	194	191	243	203
March.....	240	210	154	158	189	194	182	251	203
April.....	239	210	176	169	190	194	179	233	205
May.....	225	210	166	187	192	194	183	318	206
June.....	225	210	169	213	174	247	186	291	203
July.....	224	210	184	216	175	261	191	207	200
August.....	225	210	184	213	176	261	196	188	200

(a) Maize and kaffircorn.
(c) Wheat, oats and rye
(c) Lucerne and teff hay.

(d) Potatoes, sweet potatoes,
onions and dried beans.
(e) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and
condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Apples, Pears and Grapes on Municipal Markets.

SEASON (1 July to 30 June).	APPLES (Bushel box).						PEARS (Bushel box).		GRAPES (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johan- nesburg.
	Ohent- muri.	White Winter Pear- main.	Wem- mers- hoek.	Ohent- muri.	White Winter Pear- main.	Wem- mers- hoek.	N.M. No. 1.	Other.	All kinds.
1938-39.....	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.....	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940-41.....	8 4	7 1	6 4	8 11	10 8	5 0	8 11	6 8	1 8
1941-42.....	8 11	7 11	7 3	9 1	10 9	6 9	7 8	8 0	1 11
1942-43.....	14 9	11 6	9 1	10 8	12 11	6 11	—	10 8	1 10
1943-44.....	12 2	11 3	9 11	13 10	11 2	5 10	—	14 11	3 7
1944-45.....	14 9	13 5	11 6	12 0	17 5	8 8	—	18 2	6 10
1945-46.....	16 11	17 3	16 8	16 8	19 3	14 10	—	14 3	5 11
1946-47.....	19 4	18 6	19 0	14 6	20 7	—	—	12 10	5 2
1946—									
January.....	18 8	22 10	—	—	—	—	—	15 9	3 7
February.....	15 6	13 7	—	15 5	15 2	5 6	—	13 4	1 5
March.....	12 11	14 4	16 11	12 10	14 1	12 8	—	13 5	3 6
April.....	18 1	13 2	13 5	13 4	14 3	15 2	—	15 3	—
May.....	19 8	20 3	21 3	16 2	20 4	15 2	—	17 10	—
June.....	22 8	23 2	22 6	17 9	21 2	13 8	—	—	—
July.....	21 3	22 10	18 10	14 5	19 2	—	—	—	2 1
August.....	21 7	22 11	20 2	16 3	18 3	—	—	—	12
September.....	19 1	20 6	—	15 10	21 0	—	—	—	8 1
October.....	21 8	20 0	—	15 3	22 7	—	—	—	—
November.....	24 4	18 6	—	17 5	25 6	—	—	—	—
December.....	14 3	17 4	—	30 4	40 0	—	—	7 6	7 4
1947—									
January.....	18 0	16 7	—	27 6	—	—	—	9 5	4 5
February.....	19 8	14 5	—	19 7	—	—	—	11 2	4 7
March.....	12 3	10 5	17 8	12 0	19 3	—	—	13 9	1 10
April.....	16 1	15 2	—	13 7	19 8	—	—	12 0	—
May.....	19 4	17 1	—	12 6	22 8	—	—	38 10	—
June.....	17 7	18 0	16 0	15 5	23 2	—	—	—	—
July.....	17 7	18 11	17 0	12 2	20 7	—	—	—	11 1
August.....	22 6	21 8	16 0	13 7	20 11	—	—	—	8 7

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Prices of Avocados and Papaws on Municipal Markets.

SEASON	AVOCADOS (Per Tray). (a)				PAPAWS (b)					
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Elizabeth Std. Box.	Bloemfontein Std. Box.
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.		
1938-39.....	s. d. 1 6	s. d. 0 11	s. d. 1 3	s. d. 1 11	s. d. 2 0	s. d. 0 10	s. d. 1 7	s. d. 2 0	s. d. 2 0	s. d. 1 8
1939-40.....	2 1	1 2	1 9	2 4	2 3	0 10	1 4	1 9	1 11	1 6
1940-41.....	1 10	0 10	1 5	2 4	2 3	1 1	1 9	2 2	2 3	1 9
1941-42.....	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 2	1 11	2 0
1942-43.....	8 1	1 8	2 10	4 8	3 2	1 2	2 1	3 5	2 2	2 7
1943-44.....	4 1	1 6	3 7	5 2	3 4	1 5	2 5	4 1	3 5	3 0
1944-45.....	2 8	1 8	3 0	5 10	3 4	1 6	3 1	4 5	3 7	3 8
1945-46.....	3 8	2 5	3 11	5 10	3 6	1 6	3 6	4 8	3 8	2 9
1946-47.....	—	—	—	—	3 2	1 6	3 2	—	—	—
1946—										
January.....	8 1	1 8	5 10	9 2	8 10	1 6	4 5	7 11	6 4	8 11
February.....	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	6 4	4 7
March.....	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8
April.....	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 8	4 2
May.....	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 6
June.....	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0
July.....	4 1	1 9	5 6	6 4	4 11	2 7	5 4	6 0	6 3	4 11
August.....	5 7	5 1	6 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4
September.....	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11
October.....	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10
November.....	8 6	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8
December.....	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6
1947—										
January.....	7 11	—	5 5	—	4 6	1 8	4 10	6 6	8 0	3 9
February.....	2 8	—	2 11	—	4 9	1 5	7 10	—	8 11	—
March.....	2 0	2 1	2 11	3 11	6 5	3 10	8 2	8 1	—	3 5
April.....	2 7	1 2	2 7	3 6	6 4	1 6	6 0	6 9	7 2	4 7
May.....	2 2	1 2	3 6	4 9	3 7	2 0	3 10	5 2	4 1	3 3
June.....	2 8	1 4	3 9	4 5	3 2	1 8	3 10	4 5	3 9	3 3
July.....	3 8	1 5	4 5	5 11	3 6	1 11	3 2	4 0	3 0	3 2
August.....	5 0	2 2	5 2	5 11	2 11	1 3	2 7	3 1	2 9	3 0

(a) Season 1 January to 31 December.

(b) Season 1 April to 31 March.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag) (a)		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
1938-39.....	s. d. 1 8	s. d. 2 3	s. d. 2 0	s. d. 2 4	s. d. 1 9	s. d. 1 2	s. d. 3 8	s. d. 2 6	s. d. 6 1
1940-41.....	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42.....	2 7	3 10	2 6	3 11	3 8	3 4	8 11	8 11	17 2
1942-43.....	8 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	18 2
1943-44.....	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944-45.....	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1945-46.....	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1946-47.....	3 11	3 7	3 6	4 10	4 3	5 0	5 9	4 9	14 11
1946—									
January.....	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February.....	1 11	—	2 3	6 5	—	6 4	7 3	7 11	14 1
March.....	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.....	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May.....	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June.....	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July.....	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
August.....	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.....	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	8 7	11 5
December.....	8 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January.....	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
February.....	4 2	—	5 1	3 2	—	5 8	10 4	—	12 8
March.....	3 5	—	2 8	5 3	—	7 5	16 8	20 0	24 5
April.....	2 7	2 5	2 1	6 7	5 1	7 8	13 4	4 11	27 1
May.....	3 0	3 3	2 5	9 0	4 0	4 8	8 10	18 8	23 8
June.....	2 11	3 4	4 3	5 9	4 4	3 7	7 1	17 11	16 7
July.....	6 0	4 6	5 2	5 8	5 5	4 11	6 0	11 7	15 11
August.....	10 2	9 1	8 0	5 0	3 8	3 4	9 3	7 7	13 7

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Prices of Bananas and Pineapples on Municipal Markets.

SEASON.	BANANAS (Per Crate) (a)			PINEAPPLES. (b)							
	Cape Town.	Johannesburg.	Pretoria.	Cape Town. Box.	Durban. Doz.	Johannesburg.		Port Elizabeth. Box.	East London. Doz. Large.	Bloemfontein. Bushel Box.	
						Ordinary. Doz.	Queens and Giants. Doz.				
1938-39.....	22 5	9 10	16 5	5 4	3 8	1 1	—	3 5	1 2	4 10	
1939-40.....	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9	
1940-41.....	27 0	7 2	14 8	5 10	2 8	1 5	2 1	4 5	1 5	5 10	
1941-42.....	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2	
1942-43.....	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 8	
1943-44.....	37 8	12 2	18 10	8 3	3 6	2 4	2 1	6 8	2 10	8 4	
1944-45.....	38 10	13 0	15 8	10 4	3 9	2 6	3 9	7 3	3 3	8 6	
1945-46.....	67 0	20 1	28 7	10 4	4 7	4 1	4 8	8 11	8 11	10 7	
1946—											
January.....	31 9	14 4	14 11	10 4	3 0	3 5	3 4	8 7	2 9	9 3	
February.....	54 3	12 0	13 8	8 4	2 9	2 8	4 0	8 5	4 6	9 7	
March.....	69 7	17 8	24 6	9 10	5 9	3 0	3 8	7 1	6 7	11 6	
April.....	75 5	29 5	17 7	11 8	5 7	4 0	5 4	9 5	2 7	9 4	
May.....	76 8	29 8	22 2	7 6	4 6	3 4	3 6	8 8	3 10	8 7	
June.....	77 11	23 5	26 7	10 7	5 0	4 7	1 7	7 5	6 3	12 3	
July.....	60 11	25 4	25 8	15 7	3 2	9 3	10 3	15 5	5 7	13 5	
August.....	72 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10	
September.....	66 5	20 6	30 8	10 1	7 7	6 5	7 2	12 2	4 7	13 11	
October.....	78 10	28 6	34 6	15 5	6 5	6 9	6 5	13 10	4 3	14 5	
November.....	63 8	47 10	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11	
December.....	67 7	30 7	35 4	16 5	4 5	7 0	—	11 11	4 7	17 8	
1947—											
January.....	41 7	20 2	20 4	9 2	5 1	2 3	3 6	6 8	3 6	7 5	
February.....	46 0	14 10	15 10	6 10	2 0	2 0	2 7	5 4	3 7	6 8	
March.....	47 5	18 4	22 10	9 3	—	3 6	—	8 3	5 2	11 8	
April.....	57 2	24 8	23 8	12 9	—	4 5	—	9 5	4 1	13 10	
May.....	62 0	20 1	26 8	7 11	—	4 3	—	8 2	4 4	9 6	
June.....	32 7	19 6	23 11	9 3	—	3 8	—	6 11	2 11	9 6	
July.....	55 1	17 6	23 4	7 3	—	4 3	—	7 5	3 7	8 7	
August.....	44 6	20 4	16 9	8 5	7 2	5 2	—	9 9	3 0	9 11	

(a) Season 1 January to 31 December.

(b) Season 1 October to 30 September.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannesburg. Table.	Durban.	Cape Town.
1938-39.....	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40.....	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1940-41.....	6 3	9 10	7 8	9 11	9 8	10 5	5 7	5 9	5 0
1941-42.....	12 5	12 8	9 10	11 11	11 2	12 7	7 8	6 4	5 5
1942-43.....	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1943-44.....	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1944-45.....	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1945-46.....	14 3	18 5	15 0	18 1	18 8	19 5	17 8	15 1	16 8
1946-47.....	12 4	14 11	12 9	15 8	14 9	15 7	14 11	13 5	14 7
1946-47.....	21 0	19 0	17 4	19 8	23 2	20 0	16 8	14 6	16 11
1946—									
January.....	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 8
February.....	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 8	17 2
March.....	11 4	12 4	9 9	12 10	12 9	13 5	18 5	14 8	14 4
April.....	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May.....	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June.....	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July.....	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August.....	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 8
September.....	20 9	25 3	20 4	23 2	21 5	23 8	20 0	16 5	22 11
October.....	24 9	28 1	32 5	24 0	32 8	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December.....	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1947—									
January.....	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 8
February.....	14 8	14 5	11 9	13 7	16 1	17 8	16 11	7 6	18 11
March.....	17 6	18 7	14 3	20 3	13 4	17 6	15 6	13 4	14 1
April.....	20 7	22 2	17 10	22 3	24 11	24 4	12 7	8 4	10 9
May.....	22 4	24 11	20 11	24 2	27 5	24 1	10 1	8 6	11 7
June.....	26 2	26 9	23 3	26 9	28 4	27 2	9 9	7 5	11 5
July.....	31 5	31 5	25 2	30 6	29 10	34 6	8 6	7 10	10 9
August.....	22 5	42 8	40 2	43 0	37 8	42 11	8 2	6 5	8 1

CROPS AND MARKETS.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1 July to 30 June).	CABBAGES (Bag). (a)			CAULIFLOWER (Bag). (a)			TOMATOES (Trays 15 lb.).			
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johannesburg.			
							N.M. No 1.	Other.	Cape Town.	Durban.
1938-39.....	s. d. 3 10	s. d. 3 0	s. d. 3 10	s. d. 3 0	s. d. 1 8	s. d. 3 5	s. d. 2 2	s. d. 1 3	s. d. 1 8	s. d. 0 10
1940-41.....	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941-42.....	5 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942-43.....	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943-44.....	11 1	7 4	17 6	9 2	6 2	12 1	5 5	2 9	3 7	2 0
1944-45.....	9 7	6 11	13 5	7 5	6 6	9 8	4 1	2 0	2 10	1 9
1945-46.....	10 1	7 1	10 11	8 4	6 5	11 1	4 11	2 4	3 4	1 7
1946-47.....	6 7	6 4	10 6	8 4	11 2	10 5	4 3	2 5	2 8	2 5
1946—										
January.....	9 7	8 0	14 8	14 5	9 0	—	4 3	1 10	2 5	1 3
February.....	7 8	9 1	18 1	10 10	6 6	—	4 2	1 7	1 11	1 8
March.....	8 11	7 3	14 4	7 2	9 8	3 4	6 2	3 8	2 6	1 6
April.....	9 10	5 8	9 0	6 7	15 4	12 4	8 1	3 6	2 8	2 0
May.....	8 4	3 4	7 7	7 2	5 3	9 1	6 3	2 11	3 8	2 8
June.....	5 10	2 4	11 0	7 7	3 1	12 1	4 2	2 0	2 10	1 5
July.....	7 11	1 10	9 9	8 6	—	11 3	2 2	1 1	2 3	1 0
August.....	5 9	2 1	7 1	8 9	3 2	11 1	2 5	1 3	1 11	0 9
September.....	4 11	2 5	5 8	9 6	4 0	13 7	3 2	1 9	2 2	1 1
October.....	5 6	8 0	7 0	15 10	13 7	12 0	4 5	1 9	2 8	0 11
November.....	5 7	11 5	12 0	13 4	15 1	—	5 2	2 1	3 4	1 1
December.....	8 9	9 11	11 11	11 10	—	—	4 8	1 11	3 0	1 10
1947—										
January.....	9 0	12 3	5 9	11 3	23 8	—	5 0	2 0	2 11	1 6
February.....	11 4	14 10	14 3	12 5	15 2	—	5 6	2 3	3 4	3 1
March.....	12 0	17 2	17 6	12 1	16 6	31 5	7 10	3 9	4 0	2 9
April.....	7 1	14 9	16 0	6 2	14 2	11 9	6 2	2 9	3 8	2 3
May.....	6 8	10 4	12 1	7 0	9 9	9 5	7 4	3 8	2 10	2 5
June.....	6 1	8 3	8 6	8 5	8 8	9 0	5 2	2 5	4 4	1 1
July.....	6 0	6 9	7 0	7 4	7 6	9 10	3 8	1 8	2 3	1 9
August.....	4 1	7 3	5 5	5 1	10 3	5 5	3 10	1 11	2 9	1 3

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 150 lb.; Cape Town, 105 lb. and Durban, 90 lb. For cauliflower—Johannesburg 100 lb.; Cape Town, 65 lb and Durban, 85 lb

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b)	LUCERNE (per 100 lb.).			Teff Johan- nesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (a).		
	Cape.	Trans- vaal.			K1.	K2.	Speckled Sugar	Cow- peas	Kid- ney.
1938-39.....	s. d. 3 10	s. d. 3 1	s. d. 4 0	s. d. 2 7	s. d. 18 1	s. d. 12 9	s. d. 25 0	s. d. 16 9	s. d. 24 2
1939-40.....	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.....	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.....	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43.....	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.....	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.....	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1945-46.....	6 6	5 11	7 7	4 8	24 8	24 8	101 0	62 10	82 8
1946-47.....	5 11	5 7	7 5	4 3	45 9	45 9	78 11	42 9	61 9
1946—									
January.....	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February.....	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March.....	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.....	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May.....	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June.....	7 3	5 6	7 6	4 5	60 8	60 8	94 2	45 9	66 1
July.....	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August.....	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.....	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December.....	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1947—									
January.....	5 10	5 11	7 5	3 8	48 9	48 9	61 4	38 11	51 4
February.....	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 3
March.....	6 3	5 10	7 5	3 11	40 8	40 8	47 1	35 1	49 3
April.....	7 1	6 10	7 8	4 7	33 4	38 4	55 7	42 3	56 1
May.....	6 8	7 6	7 9	4 6	33 5	33 5	50 8	38 2	50 0
June.....	6 9	6 9	8 3	4 7	33 0	33 0	50 4	41 2	49 9
July.....	7 4	7 1	6 9	5 1	30 5	30 5	45 9	38 7	48 9
August.....	7 4	6 5	8 4	5 2	32 7	32 7	52 4	43 0	49 2

(a) Municipal Market.

(b) Seasonal year for kaffircorn.
1 June-31 May.

Dry Beans, 1 April-31 March;

Lucerne and teff, 1 July-
30 June.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season 1 July to 30 June.	Johannesburg.			Durban.		Pretoria.	Cape Town.	
	Trans- vaal N.M. all classes. Grade I.	Transvaal.		Natal Ordinary No. I.	O.F.S. Ordinary No. I.	Trans- vaal N.M. classes. Grade I.	Cape Ordinary No. I.	Trans- vaal Ordinary No. I.
		Ordinary No. I.	Ordinary No. II.					
1938-39....	s. d. 8 5	s. d. 6 9	s. d. 6 2	s. d. 8 10	s. d. 8 4	s. d. 8 5	s. d. 8 2	s. d. 8 6
1939-40....	8 4	6 7	6 7	9 10	8 9	8 3	9 0	10 2
1940-41....	18 4	14 2	13 4	16 10	17 1	15 10	15 7	17 0
1941-42....	24 8	19 3	18 7	23 3	21 0	25 1	20 1	22 7
1942-43....	16 4	13 7	12 6	16 9	17 8	16 6	15 0	17 8
1943-44....	28 10	17 1	15 0	23 6	19 4	20 5	21 2	22 10
1944-45....	25 6	25 1	19 2	25 5	24 4	25 4	25 4	28 1
(a)	Grade I.	Grade II.	Grade III.	Grade I, all classes.	Grade I, all classes.	Grade I.	Grade I, all classes.	Grade I, all classes.
1945-46....	30 11	24 11	15 9	28 9	29 8	29 6	30 11	30 7
1946-47..	20 5	16 3	13 0	18 8	24 3	19 6	23 1	15 11
1946—								
January..	34 8	30 9	19 5	34 1	—	35 8	31 6	—
February.	25 7	19 5	11 3	28 2	30 6	24 2	35 6	33 3
March....	23 9	18 3	11 7	26 3	25 11	24 0	29 8	29 5
April....	27 0	22 2	13 8	28 4	36 8	27 3	31 1	32 6
May.....	27 3	21 5	13 1	28 2	29 1	25 2	27 1	27 11
June.....	28 0	23 3	15 8	25 8	25 9	29 0	30 8	30 4
July.....	28 8	23 11	16 2	31 11	32 0	31 3	31 5	32 10
August...	31 9	26 1	16 0	33 6	32 5	33 2	33 2	34 6
September	35 8	28 0	17 7	35 9	36 6	35 6	33 11	34 6
October...	36 3	29 2	20 11	36 10	37 2	33 11	34 6	—
November	26 10	23 5	16 0	33 9	33 10	24 8	28 11	—
December	18 11	16 0	12 1	26 6	29 9	19 6	19 4	—
1947—								
January..	12 4	9 0	6 5	15 1	—	11 8	15 6	15 1
February.	10 1	7 9	5 9	12 7	12 11	9 9	15 5	14 9
March....	9 6	7 2	5 10	14 0	9 10	9 7	12 9	13 5
April....	11 5	8 2	6 3	12 10	11 7	11 10	15 3	13 11
May.....	12 8	9 10	7 4	17 8	17 6	12 8	18 0	14 7
June.....	17 4	13 4	9 5	18 7	16 11	17 5	21 11	17 8
July.....	16 11	12 5	7 11	20 1	19 4	16 1	22 11	18 0
August...	16 2	10 5	6 5	16 7	16 3	15 2	21 6	20 10

(a) As from July 1945 compulsory grading was introduced on the nine controlled markets of the Union and the National Mark grades were abolished.

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[NOTE.—Articles from *Farming in South Africa* may be published
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The Destruction of Harmful Birds.

Dr. Bernard Smit, Principal Entomologist, Pretoria.

FARMERS often complain that their wheat, mealies, kaffircorn and fruit are attacked by birds, and ask what measures can be taken to destroy these birds when they become harmful in this way.

The question of destroying birds is, however, a delicate subject and must be discussed with a good deal of caution. Apart from the sentiment which many people attach to birds and the pleasure they give on account of their beauty and song, there is no doubt that most birds do an immense amount of good by feeding on harmful insects.

In Dr. Austin Roberts' book on the Birds of South Africa, there are eight hundred and seventy-five species described and, if the notes on their feeding habits given in that book are studied, it will be seen that most of them live on insects. Many take a mixed diet of insects, small fruits and wild berries, while comparatively few feed on seeds and grains. Of those that do feed on seeds, some do a great amount of good by destroying weed seeds. On the other hand, some birds spread weed seeds and also insect pests like the scale insects which infest fruit trees.

It is not easy to tell by observation what food birds are eating when they are seen in the veld, and our knowledge of their diet in South Africa is very far from complete. The only way to be sure of the diet of birds is to examine the contents of their crops after killing them and to make careful counts of seeds, parts of insects, etc., which are found there. Very little of this work has been done in South Africa.

We know, however, that some families of birds feed exclusively on insects, as for example, the swallows and swifts. The woodpeckers and hoopoes destroy wood-boring beetles and white grubs, and the thrushes and warblers eat innumerable insects about the veld. The locust birds, like the white stork, are famous for the numbers of locusts they can eat.

Most birds are general feeders and eat whatever food is available about them. Thus, while insects are abundant during most of the year, they eat enormous numbers of these and then during winter, when the insects are scarce, they may turn to seeds or berries. There are a few birds like the louries and mouse birds (*muisvoëls*) that feed exclusively on berries and fruits.

Some Birds become Pests by Accident.

It is usually more by accident than anything else, that some birds have become pests by eating grain and fruit. In the case of the starlings they have increased in some areas to such an extent that they fly in droves and do a great deal of damage in orchards. The weavers which include the waxbills, sparrows (*mossies*), finches and canaries feed mostly on grain, and in some areas where wheat is grown these have undoubtedly become a serious pest. They destroy a great deal of the grain in the early spring before the harvest.

Crows can be very destructive in mealie lands where they peck out freshly planted mealies before they have germinated.

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Editorial:

Weeds and Soil Conservation.

WITH the reorganization of the field services of the Department and with the establishment of the Regional Offices which serve the five regions into which the Union has been divided, all field officers of the organization are now required to assist in the administration of the Weeds Act, Act No. 42 of 1937. Formerly Weed Control was the function of a special weed section, and weed control duties were undertaken by weed inspectors under the control of five chief weed inspectors. It was found that in most parts of the country the services of weed inspectors could be used to full advantage for only about six months of the year, and in view of the great shortage of field staff, these officers were absorbed into the Soil Conservation Services of the Department.

The viewpoint held by the Department in regard to weed control, is that weeds have no place in the improved farming systems envisaged under conservation farming, and that, as the requirements of this new trend in farming development became more widespread among our farmers, they themselves would ensure that weeds would be strictly controlled on their farms. In this regard it is also anticipated that a spirit of competition will develop between the large number of conservation districts already established or in the process of being formed.

The Department feels that it has done its share towards ridding the country of weeds, and is prepared to do a great deal more, provided the farmers also do their share. At very considerable expense, all the major rivers of the country, which were badly infested with weeds, have been systematically cleared. This service is being continued and extended, and will include the rivers where weed control is beyond the means of the riparian owners. The prickly pear eradication schemes have been a great success, and approximately three-quarters of a million morgen of heavily infested land have been cleared of this serious weed at a cost of some £250,000. Jointed cactus, one of the greatest scourges of the eastern Cape Province, is at present being eradicated at State expense. Other weed problems are being studied, and eradication schemes are under consideration.

Although these activities are of the greatest importance in controlling the weeds of the country, they will in themselves never solve the problem. It is necessary that each individual farmer shall eradicate the weeds on his own farm before we can face the future with equanimity.

Considerable attention has been given to making this viewpoint known to farmers, but the response on the whole has been disappointing. It appears that some farmers do not yet fully appreciate the danger of weeds and the enormous losses caused

thereby, and also that the duty of controlling weeds is theirs. There are signs that the weed situation in the country is deteriorating, and the Department feels compelled to issue a warning that, unless great improvement occurs, drastic action under the Weeds Act will have to be taken.

(Ernest du Toit, Division of Soil Conservation and Extension.)

The Destruction of Harmful Birds:—

[Continued from page 846.]

When we weigh up all the evidence, however, and consider the enormous number of insects that the birds destroy, we must come to the conclusion that on the whole they are our very good friends and should not be destroyed unless it is absolutely necessary. Before setting out, therefore, to destroy birds, every farmer and fruit grower should consider the matter carefully and decide whether on the whole he is justified in doing so. In many cases it is better to use methods to scare the birds away from the crops rather than to kill them, and in some cases it may even be better to put up with some loss at one season of the year in order to gain from the birds' attack on insect pests at other seasons.

Scares and Traps.

Where a crop like wheat is being destroyed by thousands of finches (*vinke*) or a crop of fruit is being eaten up by "*muisvoëls*", we cannot, of course, expect the farmer to sit and do nothing. It is often possible, by shooting a few of the birds to frighten the others away, or by employing a few "*piccanins*" to beat empty tins around the lands to keep them from doing much harm.

In fruit trees a system of wires and empty tins may be arranged to make a very effective bird scare. The tins are hung upside down with small weights hung in them to act as clappers so that they serve as small bells. Any disturbance of the tree sets these "*bells*" jingling and frightens the birds away. Such methods are more effective after a few birds have been shot in the tree. In some special cases fruit growers have gone so far as to cover their fruit trees and grape vines with bird netting or old fish netting stretched over iron or wooden frames. This is usually practical only in small gardens.

In gardens about houses the sparrow or "*mossie*" is one of the best known of small birds and often breeds so prolifically as to become a pest—as Austin Roberts says, "often arousing the ire of gardeners". Sometimes they swarm down into fowl runs and eat up the grain that is intended for the fowls. They also do considerable damage in fruit trees in spring where they peck off young fruit buds and setting fruits at blossom time. On the other hand, it must not be forgotten that they eat a large number of insects, particularly lawn caterpillars on which they feed their young.

"The best method of ridding a locality of sparrows is to destroy their nests regularly. They can be torn down from trees, the eaves of houses and such places, with a long pole having an iron hook at the end.

The Production of Maize.

J. J. du Toit, Lecturer in Field Husbandry, College of Agriculture, Potchefstroom.

MAIZE is not an indigenous crop in our country like kaffircorn and cowpeas, but comes from America where it was cultivated by the Red Indians long before Columbus discovered that country. The first maize was introduced into South Africa from Holland under the name of "Turchsche Tarwe" shortly after van Riebeeck landed here, namely on the 25th of October, 1655. Owing to unfavourable climatic conditions for the successful production of maize in the winter-rainfall area, the crop was, however, not extensively grown in South Africa until after the Anglo-Boer War of 1899-1902, when the summer-rainfall area became more densely populated and was found to be suitable for the culture of this crop. The first big quantity of maize was exported from this country in 1907 and since then production increased rapidly, so that maize is at present the most important grain crop in the Union. A record crop of 29 million bags was obtained in 1939. The average annual maize output is about six times that of wheat and eight times that of oats. In future, maize will probably remain the most important cereal in the Union, since there are still great possibilities of increasing the average yield per morgen by the adoption of better weed control measures, the application of greater quantities of fertilizers and the use of better-bred seed, especially hybrid seed.

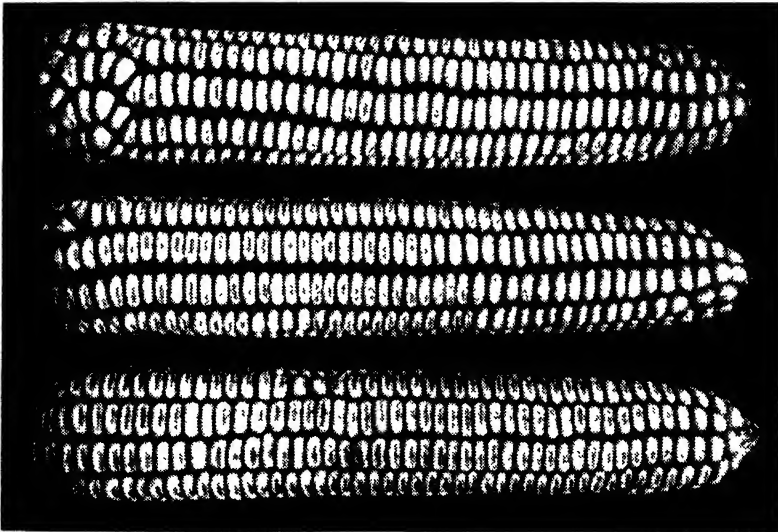


FIG. 1.—Well-shaped healthy maize ears.

Incidentally it can be mentioned that in America maize is known as "corn". In English the name "maize", which originates from the Spanish word "mais", is to be preferred to the name "mealies" which has been taken over from the Afrikaans word "mielie". The latter originates from the Portuguese word "milo", a name which was used to designate certain kinds of sorghums or kaffircorn.

As a world crop maize is the most important cereal and next to potatoes it is the most important article of food for man and beast. In order of importance as regards total yields in the world, potatoes

are first on the list, followed by maize, wheat, rice, oats, rye and barley.

Cultivation, and Yields in the Union.

Although the crop is cultivated in most parts of the Union, the greatest quantity of maize is being produced in the so-called maize triangle, i.e. a triangle formed by the three towns Carolina, Mafeking and Ladybrand as vertices. More than two-thirds of the total annual output in the Union is produced in this triangle. During some years however, fairly large quantities of maize are also produced on the Springbok Flats and in parts of Natal. The district of Kroonstad has the honour of producing the greatest average annual quantity of maize, but if size of district is taken into account, then Bethal is the leading maize producing district.

The total annual yields in the Union fluctuate considerably, namely, from about 14 to 29 million bags. These fluctuations are attributable mainly to the erratic nature of the annual rainfall and have far-reaching detrimental effects on the welfare of our country. Maize is our most important food crop and plays a big rôle in our national economy. If production is unstable, farmers cannot depend on a regular income, while the native population and farm animals suffer from starvation during seasons when crop failures are experienced. The annual maize requirements of the Union are approximately 21 to 22 million bags. With the expansion of manufacturing and mining industries the annual consumption will probably increase in the near future.

In order to ensure greater stability in farming and to avoid serious animal losses during times of drought, surplus quantities of maize obtained during favourable seasons should be stored for times of scarcity. The great drawback, however, is the lack of suitable storage places. The grain elevator system of the S.A. Railways and Harbours has a capacity of only 1,829,500 bags. Moreover, these grain elevators are not intended as storage places for reserve supplies of grain. Suitable tanks in which 10 or more million bags of maize can be stored for long periods and in which the grain can be regularly and properly fumigated to control insect pests, are obviously most essential for the welfare of our country.

Climatic Requirements.

Maize succeeds best in areas having a comparatively warm summer climate and an evenly distributed rainfall during the growing season. For the best results the crop requires 1-1½ inches of rain every 12-14 days from the end of October to the end of March. If rains should remain away for a longer period than about 20 days after the previous good rain, the crop generally begins to suffer from drought, i.e. in the case of ordinary loam soils during the hot summer months. The best maize crops in the summer-rainfall area are generally obtained in the 25 to 30-inch rainfall belt, although good yields are also obtained in the 20 to 25-inch belt during normal seasons.

Maize is not resistant to frost and serious losses are sometimes suffered on account of unexpected early frosts in autumn, i.e. early in April. If the first rains in spring should occur late in the season, quick-growing varieties of maize should be chosen that will be mature before the 20th of April, i.e. when the first killing frost generally occurs on the highveld.

Soil Requirements.

The crop succeeds well on a great variety of agricultural soils. It can be successfully grown on heavy clay, as well as on comparatively

THE PRODUCTION OF MAIZE.

light sandy soils. For the best results, however, it prefers a fertile loam soil, which is not too acid or too alkaline. Most soils in the summer-rainfall area are deficient in phosphates and in many cases also in organic material. As regards potash and nitrogen, it appears from experiments carried out at the Potchefstroom College of Agriculture, and also elsewhere, that adequate quantities of these plant foods are generally present in most soils under dryland conditions. In fact, the application of potash to maize seems to have a depressing effect on the grain yields, as can be seen from the results given below.

Superphosphate is the phosphatic fertilizer most commonly used for maize. In most cases an application of 200 to 400 lb. (15 percent soluble P_2O_5) gives the best results.

Fertilizer Experiment with Maize.

In a fertilizer experiment now in progress for 24 years at Potchefstroom the following maize yields (averages for 23 years) were obtained per morgen:—

Treatment.	Average yield per morgen.
	Bags.
(1) No fertilizer (control).....	14·8
(2) 400 lb. superphosphate (17·1 %) per morgen.....	19·88
(3) 400 lb. super + 100 lb. ammonium sulphate.....	18·94
(4) 400 lb. super + 100 lb. ammonium sulphate + 50 lb potash.....	18·94
(5) 4 tons kraal manure.....	20·58
(6) 400 lb. super + 4 tons manure.....	22·07
(7) 200 lb. super + 200 lb. rock phosphate.....	21·35
(8) 400 lb. rock phosphate.....	20·09

From the above figures it will be observed that manure and superphosphate gave the best results, while manure alone gave a somewhat higher average yield than superphosphate alone (4 tons of manure contain about the same quantity of phosphoric oxide as 400 lb. superphosphate). Owing to the scarcity of kraal manure, it is generally out of the question to apply manure or compost to extensive maize fields at the rate of 4 tons per morgen. Moreover, mention can be made of the fact that the plots which received 4 tons of manure annually for a period of 24 years show no differences in colour and texture as compared with the fertilized plots, and there is no evidence that the organic matter content of the soil has been increased, or that the physical condition of the soil has been improved. The rate of destruction of the organic matter under our climatic conditions is probably such that the manure, in the quantity applied (4 tons per morgen), might never be able to exercise any noticeable or measurable influence on the colour and structure of the soil. The phenomenon is an important matter. Many farmers are under the impression that even as little as 500 lb. of hammer-milled manure, applied through fertilizer attachments in a mixture with fertilizer, will help to maintain or improve the physical condition of their soils. According to the above results not even 4 tons of manure per morgen, applied annually for so many years, show any visual improvement apart from the increase in yield which is attributable mainly to the phosphate content of the manure.

From the point of view of long-term fertilizer policy an important fact disclosed by the data given above is the increasing value of rock phosphate as compared with superphosphate. In the first five-year period the yield from rock phosphate was significantly lower than that from super; thereafter the yields are level, and during the last 10 years rock phosphate has been superior to superphosphate and as good as kraal manure. In areas where soils are somewhat sour or

acid it will be better to use rock phosphate alone, or in a 50 per cent. mixture with super, instead of super alone. The mixture can be applied at the rate of 400 lb. per morgen.

As regards the method of applying fertilizer, it can be recommended that in areas receiving on an average 28 or more inches of rain per annum, the fertilizer should be applied, by means of fertilizer attachments, in the rows in which the maize is planted, while in areas with a lower rainfall the fertilizer should be applied broadcast and ploughed under during winter, or worked into the soil by means of a disc-harrow.

Popular Varieties of Maize.

Apart from bread mealies, sugar maize (sweet corn) and popcorn, types which are grown only on a limited scale in this country, there are numerous varieties of both dent and flint types that are commonly grown in the different maize areas. The following are some of the more popular varieties:—

White dents.—Hickory King, with a growing period of approximately 150 days; Potchefstroom Pearl (150 days); Synthetic or Improved Potchefstroom Pearl (135-140 days); Anveld (125-130 days); Improved Anveld (115-120 days); Silver King (130 days); Early King (130-135 days); Wisconsin (120 days); and Natal White Horse-Tooth (160 days). Of these varieties the Improved Potchefstroom Pearl can be strongly recommended as a drought-resistant, medium early, heavy-yielding white dent, although Early King is also a good alternative variety. The last-mentioned variety is more or less the same type as the so-called Durr and Mick Success.

As regards early varieties there are very few that will outyield the Synthetic Anveld. In variety trials at Potchefstroom it produced excellent results, especially during comparatively dry seasons.

Yellow dents.—Sahara (150 days); Golden Beauty (150 days); Kroonstad Ruby (140 days); Chester County Mammoth (140 days); and Natal Yellow Horse-Tooth (160 days) are some of the more important varieties. The first-mentioned is regarded as one of the best yellow varieties, as it yields well even on comparatively poor soils. It is also a good variety to plant for silage purposes. In most areas it can safely be planted up to the 20th of November for grain production purposes.

White flints.—American White Flint (130 days); White Congo (130 days); and White Botman (100-110 days).

Yellow flints.—Cincinnati (Bushman) (120 days); Natal-8-row (120 days); Hotnot (110 days); and Peruvian (110 days).

As regards flints it can be stated that the American White Flint is a suitable variety for production in areas where misty weather conditions frequently prevail, as, for example, in the eastern Orange Free State, eastern Transvaal and in parts of Natal.

In choosing suitable varieties it should be borne in mind that yellow varieties are more suitable than white varieties for stock-feeding purposes owing to the presence of an extra vitamin which is lacking in white maize.

Hybrid Maize.

As a result of the great success obtained with the use of hybrid maize in the United States, breeding work is in progress in this country with the object of producing suitable hybrid types that will be successful under our climatic conditions and give yields that might be 20-30 per cent. higher than those from ordinary varieties. It is hoped that such hybrid seed will be available for distribution purposes in two to three years' time.

THE PRODUCTION OF MAIZE.

Rate of Seeding.

When maize is to be planted in rows 3 feet apart and 18 inches apart in the rows, the following quantities will generally be required per morgen. Hickory King, 25 to 30 lb.; Potchefstroom Pearl, Anveld and Sahara, 20 to 25 lb.; American White Flint, White Cango and Natal-8-row, 15 to 20 lb.; and Bushman (Cincinnati), Peruvian and Hotnot, about 12 to 15 lb. per morgen.

Seedbed Preparation.

In most parts of the maize area the lands should be ploughed during the winter period, i.e. during June, July or August. The ground is then generally still fairly moist from late autumn rains, while the oxen are still in a fairly good condition. A further advantage of winter ploughing is the fact that the larvae of insect pests, as well as the roots of kweek grass and other perennial weeds are exposed to the severe frosts during winter with the result that many are killed.

When ploughed and exposed to the weathering agencies during winter the soil is rendered somewhat more fertile, while it is also left in a more receptive condition for early spring rains.

If the winter ploughing has been properly done, 7 to 8 inches deep, it will not be necessary to plough again in spring and there will then be more time to destroy one or two crops of weeds before the maize is planted. A disc-harrow, or an ordinary heavy spike-tooth harrow can be effectively used to destroy the first crop of weeds about five to eight days after the first rain in spring. At the same time a fine seedbed is prepared. If time permits, a second batch of weeds can be destroyed before the maize is planted towards the end of October and during November.

Time and Methods of Planting.

Maize can be planted at any time from September onwards until the first week in January, that is, as soon as all danger of frost is over and moisture conditions are favourable. The best planting time is generally from the end of October to the middle of December. For plantings in December early-maturing varieties such as Synthetic Anveld and Yellow Cincinnati should be chosen.

The ordinary method of planting is to drill the seed by means of a maize planter in rows 3 feet apart and 15, 18, 24, 30 or 36 inches apart in the rows, depending on the rainfall in the particular area. There is a general tendency to space the seed too close together in the rows. Under dryland conditions an eventual spacing of 36 in. x 18 in. can be recommended in the better-rainfall areas, and 36 in. x 24 in. to 30 in. in the northern and western Transvaal, western Orange Free State and other areas where the average annual rainfall is less than 25 inches per annum. The optimum depth of planting maize is about 3 inches in the case of ordinary loam soils.

Apart from the drilling method there are several other systems of planting in vogue, as for example, the checkrow method, the lister method and the so-called wide-row system. The last-mentioned system seems to have drawn a great deal of attention lately. The seed is drilled in rows 7 or 9 feet apart, so that weeds can be quickly and effectively destroyed by means of a tractor and a 6 or 8-foot disc-harrow. In the rows the seeds are spaced about 12 inches apart. In February or at the beginning of March, when the maize cobs are well developed and almost mature, oats or rye is sown between the wide rows for winter-grazing purposes. It is claimed that the maize yields are generally not much lower than those from maize planted in 3-foot rows, chiefly because weeds can be better controlled. The value of

the oat or rye grazing will also offset the reduction in maize yields. It should be emphasized, however, that it is a great mistake to plant some or other legume such as cowpeas or soya beans between the wide rows of maize, i.e. either at the time the maize is planted in November or later in January. An experiment in progress at Potchefstroom has shown that the planting of cowpeas in alternate rows with maize reduces the maize yields per morgen by as much as five to six bags and it is doubtful whether the value of the cowpea hay obtained will justify the reduction in maize yields.* The practice of growing legumes in a mixture, or in alternate rows with maize, cannot therefore be recommended. Much better results will be obtained if each kind of crop is planted on a separate land and cultivated properly in a suitable system of rotation.

The checkrow method of planting can be strongly recommended in the higher-rainfall areas where weeds are very troublesome. About two to three seeds are planted together in hills spaced 36 in. \times 36 in. or 42 in. \times 42 in. so that the land can be cultivated across as well as lengthwise, or even diagonally across. A tractor and a four-row planter, fitted with the checkrow attachments, can be used for planting the seed in this manner. This method of planting will probably receive greater attention in the future when farms become smaller and a more efficient type of labourer becomes available. A fair amount of intelligence is required to know how to use the planter and restake the check wire at the turnings.

Weed Control.

Proper weed control is probably one of the main secrets of success in maize production. In the fertilizer experiment previously mentioned the average yield on the control plots that received no fertilizer of any kind for a period of 23 years is still as high as 14.8 bags of maize per morgen. The soil on which the experiment is being carried out is not exceptionally fertile and the maize was grown under ordinary rainfall conditions. Several severe droughts were experienced during the 23-year period. During this period farmers in the western Transvaal obtained an average yield of only about 4½ bags per morgen, notwithstanding the fact that many of them also applied some fertilizer. The yields on the control plots were high, primarily because all weeds were regularly destroyed to prevent them from masking the effects of the various quantities of fertilizer and manure applied to the maize. Under ordinary farm conditions it might be uneconomical to control weeds 100 per cent. by means of hand labour, but the results of the experiment nevertheless give an indication that, notwithstanding the occurrence of periodic droughts, average yields of about 14 bags of maize can be obtained per morgen without any fertilizer and 20 bags with fertilizer, provided weeds are properly controlled. *Weeds and not so much droughts are the main cause of low yields per morgen.*

The destruction of one or two batches of young weeds before the maize is to be planted, followed by several harrowing operations when the maize seedlings are about 3 in., 6 in. and 9 to 12 in. high, and thereafter by regular cultivations by means of suitable cultivators, can be recommended as suitable practices to control annual weeds such as khaki bush, stinkblaar (*Datura* spp.), sweet grass, etc. Remember that the best stage to tackle these weeds is just when their seedlings appear. Failure to destroy them at this critical stage of growth might later have disastrous results when the weeds are well rooted and continuous rains might hamper cultivation work. Not

* See Science Bulletin No. 246, Field Experiments at Potchefstroom, (pp. 21—33), by R. A. Saunders and F. X. Laubacher.

THE PRODUCTION OF MAIZE.

only the weeds in the lands should be eradicated, but those around the fields should also be prevented from producing fresh seeds by cutting them down regularly with mowing machines. It must also be remembered that only those weed seeds that are situated in the upper 4 inches of soil generally germinate. Those deeper in the soil will only germinate and grow when brought closer to the surface by ploughing operations. Otherwise they lie dormant until the following year so that a single season's effort to destroy weeds will not be sufficient. A determined attempt should be made to keep weeds under proper control year after year.



FIG. 2.—Maize-breeding experiments at Potchefstroom.

As regards weeds such as witchweed, nut grass (uintjies) and Johnson's grass, special control measures will have to be resorted to. Full particulars can be obtained from the Department of Agriculture.

Harvesting.

Maize is generally harvested after the first frosts have occurred in autumn and when the cobs are sufficiently dry. May, June and July is the usual time for harvesting the crop. The mature cobs are picked by hand in bags or baskets, and later carted from the field. The threshing is done by means of an ordinary maize thresher. Owing to the shortage of hand labour on many farms it is possible that greater use will be made of combines from the United States in the near future, especially when hybrid maize types that are uniform in height and habit of growth become available. The combines are useful machines that harvest and thresh the maize in the field in one and the same operation.

Another method of harvesting is the so-called stooking or American method. The plants are cut in the field with cane knives or sickles as soon as the cobs are in the hard glazed stage and placed in upright conical stooks. At this stage the majority of the leaves and stems of the plants are still in a succulent condition and have a

somewhat higher feeding value than when fully mature. The plants from 20 to 30 rows are placed in one row of stooks. Each stook is made about 5-6 feet in diameter at the base and tied round the top with selfbinder twine, or in some other way, to keep the plants in an upright position. About six weeks later, when both the plants and cobs are dry, the latter are removed and threshed in the usual manner, while the stalks, now known as stover, are placed in a big stack for winter use. The feeding value of such stover will be fairly high, while the maize shelled from the cobs will be of normal quality. This method of harvesting is, of course, not practical on a large scale, but where a system of mixed farming is practised, it can be strongly recommended that at least a portion of the maize fields should be harvested in this manner. The stover will be most useful for keeping animals in good condition during times of scarcity. A further advantage is the fact that the ground between the rows of stooks can be ploughed early in winter to control the stalk borer, while the remaining strips can be ploughed over about six weeks later.

Maize for silage purposes is best cut when the cobs are in the hard dough stage, but while the leaves and stems are still in a green and succulent condition.

Yields.

An average yield of about 15 to 20 bags of maize per morgen can be regarded as a fair average return in cases where maize is grown on an extensive scale, but on the central highveld there are many farmers who obtain yields of 30-40 bags per morgen during favourable seasons.

About 20-30 tons of silage can be expected per morgen under fairly favourable conditions.

Grading.

Grades 1, 2 and 3 are intended for the white dent varieties such as Hickory King, Early King and Potchefstroom Pearl; grade 4 for the yellow dents; grade 5 for the white flints; grade 6 for the yellow flints; grade 7 for mixtures of white and yellow maize; and grade 8 for any maize that cannot be graded into the higher grades and that does not contain more than 40 per cent. defective or rotten grains and foreign matter. In each of the other grades mentioned only a limited percentage of defective material is permitted. The actual grading is entrusted to qualified graders in the service of the S.A. Railways and Harbours, co-operative societies and other agents of the Maize Control Board. All maize produced in the Union must be sold and delivered to the Maize Control Board or its agents and no person is allowed to sell maize to any other party, unless a permit has first been obtained from the Board.

Diseases and Insect Pests.

Fungus diseases such as Fusarium pink rot and Diplodia white rot are becoming serious in many parts of the maize-producing areas and it is advisable to treat all seed with some or other seed protectant and to practise a suitable system of crop rotation. The seed protectants are usually sold in powder form and are obtainable from co-operative societies and general seed merchants.

As regards insect pests it can be stated that the maize stalkborer is undoubtedly the most serious pest which on an average reduces the annual maize yields in the Union by 10 to 15 per cent. The application of D.D.T. powder (2½ per cent. strength and about 10 to 15 lb. per morgen) when the plants are in the funnel stage, will generally be very effective in controlling the pest. Winter ploughing will also help.

The Food and Agriculture Organization of the United Nations.

Review of the Third Conference.

A. J. du Plessis, Division of Economics and Markets.

THE Food and Agriculture Organization of the United Nations recently held its third conference in the old League of Nations Buildings in Geneva, Switzerland, viz. from 23 August to 12 September, 1947.

The Food and Agriculture Organization, commonly known as the F.A.O., has actually accomplished so much during the two years of its existence in the way of international action in the study and solving of problems connected with the world's agriculture and food production and distribution that producers as well as consumers should really interest themselves much more than in the past in the activities of the Organization.

Founding and Aim of the Organization

As an introduction, therefore, a brief review of the founding, the aim and purpose of the F.A.O. would not be out of place.

It was a well-known fact that serious food shortages existed even before the war, particularly in certain parts of the world. Furthermore, it was clear to every thinking person that right from the early days of the war these conditions would definitely increase considerably in their scope and intensity should hostilities cease.

This then was a motive behind the invitation extended to all members the United Nations to hold a Conference at Hot Springs, Virginia, U.S.A., in May 1943. To this Conference, initiated by the late President Roosevelt, the F.A.O. largely owes its establishment. The necessity for such an organization was agreed upon at this Conference and an Interim Commission was appointed to do the preparatory work.

The first conference of the F.A.O. was held in October 1945 in Quebec, Canada. Forty-five countries participated in drawing up the constitution and in defining the objectives of the Organization very clearly, viz.—

(a) Raising the levels of nutrition and standards of living of people all over the world.

(b) Improvements in the efficiency of production and distribution of all food and agricultural products.

(c) Bettering the condition of rural populations.

Since the Quebec Conference, the Organization has been fully established with a permanent staff, consisting of officers specially trained to deal with the respective problems with which the Organization has to cope. In order to assist the permanent staff in an advisory capacity Standing Advisory Committees were appointed consisting of experts from all parts of the world. A Director-General was appointed by the Conference to direct the work of the Organization, Sir John Boyd Orr being the first Director-General.

Collection of Statistics.

As one of the most important functions of the F.A.O. is the rapid dissemination of knowledge and the advancement of research in connection with food and agricultural problems, one of the first steps of the Organization in achieving its goal is the collecting and co-ordinating of statistics of food and agriculture, including fisheries and forestry, from all member nations of the world, and, after co-ordinating these statistics, the rapid dissemination thereof among all member countries.

The F.A.O. also renders assistance in this connection to governments which ask for it, e.g. in the sending of missions of experts to such countries to study the problems pertaining to food and agriculture, fisheries and forestry and, if preferred, the F.A.O. is also prepared to follow this up with technical aid in working out the solution of these problems.

The F.A.O. is governed by a Conference, in which each member nation has one vote. The Conference meets at least once every year. Between sessions the Organization has until recently been attended to by an Executive Committee which exercised certain powers delegated to it by the Conference. Furthermore, since last year so-called National F.A.O. Committees were established in all member countries, which have to serve as a link between the Organization and member countries. Such a committee has already been appointed in the Union and should readers require more specific information concerning the activities of the Organization they may get in touch with the Secretary, National F.A.O. Committee, c/o Division of Economics and Markets, Union Buildings, Pretoria.

During the short time of its existence the Organization has already completed a good deal of useful work. Thus in May 1946 the F.A.O. called a Special Meeting on Urgent Food Problems where the first report on the World Food Appraisal was discussed. The result of this discussion was the creation in June 1946 of an International Emergency Food Council with a membership of 31 governments. The main functions of this body, generally known as the I.E.F.C., is to allocate foodstuffs in short supply, e.g. grains, oils, fats, etc., as well as fertilizers for the duration of the emergency. The I.E.F.C. is financially sustained by the F.A.O.

World Food Board.

A further important task undertaken by F.A.O. experts in co-operation with member governments is the compilation of a World Food Survey which shows the food supplies available before 1939 in 70 countries. This report clearly indicated the seriousness of the world's food problems, e.g. that normally more than half of the world's population before the war was undernourished and had to exist on a diet of a calorie equivalent of less than 2,250 per person per day. Even in the more prosperous countries it was found that at least one third of the population before the war received an inadequate diet, particularly as regards mineral and vitamin requirements.

At the second Conference of the F.A.O., held in Copenhagen, Denmark, September 1946, this World Food Survey, together with certain proposals of the Director-General of the Organization in connection with the creation of a World Food Board, was submitted.

The Conference, however, referred these proposals to a Preparatory Commission consisting of representatives of 17 countries, for further study and report.

This Preparatory Commission met in October 1946 in Washington D.C. and thoroughly investigated the matter, but could not in all respects agree with the proposal for the creation of a World Food Board with practically unlimited powers and authority over world food supplies. The Commission, however, recommended the establishment of a World Food Council instead, while international problems in connection with every important agricultural commodity should be dealt with by inter-government agreements, with an international council to administer each agreement.

The report of the Preparatory Commission containing all its findings and recommendations was then submitted to the F.A.O.

Third Conference.

This brings us to the third and latest Conference of the Organization which opened at Geneva, Switzerland, on the 23rd August 1947. One of the most important subjects discussed by the Conference was the report of this Commission.

The Union's delegation to the Conference consisted of Dr. P. R. Viljoen, former Secretary for Agriculture and now High Commissioner for the Union in Canada, who also acted as leader to the Delegation, Dr. P. J. du Toit, Director of the Division of Veterinary Services, Mr. S. J. de Swardt, Chief of the Division of Economics and Markets, Dr. R. Smit, Chief of the Division of Nutrition, Department of Health, and Mr. A. J. du Plessis of the Division of Economics and Markets.

The Union delegation was honoured by having its leader, Dr. P. R. Viljoen, elected as one of the 3 vice-presidents of the Conference, which meant that he was *ipso facto* also member of the General and Nomination Committees, while Dr. P. J. du Toit was elected as Chairman of one of the three Commissions into which the Conference resolved and which in fact did all the actual work of the Conference. Every member nation was represented on each of these Commissions.

Commission I dealt with—

(a) A review of the Food and Agriculture Position in the World, based on separate reports previously submitted to the F.A.O. by member nations. This Annual Review will in future be a permanent feature of the Organization.

(b) The report of the Preparatory Commission referred to above.

Commission II was concerned with the technical activities of the Organization, while Commission III confined itself to discussions of constitutional, administrative and financial matters of the F.A.O. Each of the three commissions had a lengthy agenda to dispose of and numerous resolutions were passed which cannot all be dealt with in this brief review. Only the points of outstanding and general interest are therefore touched upon.

Problems Discussed.

Commission I.—Particularly the following problems were discussed by this Commission:—

- (1) The present position of food and agriculture in the world.
- (2) Whether or not some system of allocation of foods in short supply and of farming requisites is necessary, and, if so, by which body the allocation should be undertaken.

(3) Measures to encourage production and also to deal with the problem of probable unmarketable surpluses. It was felt that if this probability could be averted, it would serve as a strong incentive to encourage producers to increase production immediately. The problem of ensuring sufficient purchasing power, especially in individual countries, was also considered in this connection. It was fully realized that should measures to this effect not be taken, all the work done would be largely nullified by the lack of the necessary purchasing power.

From the General Review of the Food and Agriculture Position and the ensuing discussion on the Report it was clear that the food position in the world had further deteriorated since July of this year, particularly as a result of the lower than expected wheat crop in India and maize crop in the U.S.A., as well as the drought prevailing in Western Europe during the past summer. Consequently, the gap between available food supplies and the minimum requirements became so great that it will lead to a most critical situation which can only be coped with by emergency measures. Unless every possible effective step is taken immediately by all governments, only the most disastrous consequences for mankind can be expected.

Furthermore, it appeared from the discussions in Commission I that there was a great necessity for the assurance of price stability on a fair level so that producers can plan with confidence for increased production.

From data submitted to the Commission it was also evident that, apart from the vast dislocation resulting from the war, the most limiting factor in increasing production is the acute shortage of nitrogenous fertilizers in the world.

The most important decisions emanating from Commission I and taken by the Conference were—

(a) That the international allocations of foodstuffs in short supply and of fertilizers must continue, as under I.E.F.C., but that the functions of this body be taken over *in toto* by the F.A.O. at the end of 1947.

(b) That the problems of price stability, encouragement of production, prevention of burdensome surpluses and expanding consumption, etc., be dealt with by means of Inter-governmental Commodity Agreements, i.e. a Commodity Council should be set up for each of the more important agricultural commodities where necessary, and after due consideration which must deal with all problems of marketing, distribution, etc., of the commodities concerned. The working of each Agricultural Commodity Council is to be reviewed by each Annual Conference of the F.A.O. In this way the F.A.O. will always be well informed regarding the position in respect of any of the commodities for which Inter-governmental Councils exist and will be in a position to make timely recommendations to governments to take steps where changes and improvements must be affected.

Technical Problems.

Commission II.—As previously stated, Commission II reviewed the technical activities of the Organization and particularly the work of the Standing Technical Advisory Committees. Already five such committees have been set up, viz. for Agriculture, Nutrition, Economics, Marketing and Statistics, Forestry, and Fisheries, whereas the establishment of a sixth, viz. for Rural Welfare, is under way. The Directors of the five already existing Committees

each submitted a report to the Commission for discussion. Important decisions concerning the programme of work for each of these Committees were taken.

Most Important Projects.

The following are some of the most important projects which were considered.

(1) A World Agricultural Survey to complement the Food Survey made in 1946. The aim is to determine how and where and to what extent changes might be made in the utilization of the world's agricultural resources and facilities in order to bring forth enough of the required types of foods and thus to raise the general nutritional standards.

(2) A study of the requirements and availability of farming requisites and equipment. While on the one hand there is a great unsatisfied demand for agricultural machinery, fertilizers, insecticides, etc., it is felt on the other hand that full use is not being made of all existing facilities in the production of these articles. It was therefore proposed that a short report be prepared of requirements and of facilities for the production of farming requisites and of expansion of production.

(3) A survey of international trade in agricultural products of each country, with special reference to the extent and nature of government control.

(4) A survey of the land-tenure situation in 15 countries.

(5) A survey of government measures to facilitate the development of agricultural co-operative undertakings.

(6) A survey of rural incomes and levels of living on farms.

(7) An investigation into the possibilities and needs of irrigation in various countries, with special consideration given to hydro-electric developments. Owing to lack of time it was decided to refer the question of the desirability of carrying out the above projects to member governments. Further, only the proposed World Census for Agriculture can be mentioned here. This census which was also discussed by Commission II, will probably be held in 1950.

Administrative Matters.

Commission III dealt with the constitutional, administrative and financial affairs of the Organization. The most important and far-reaching subject under discussion here was the establishment of an F.A.O. Council. The proposals contained in the report of the Preparatory Commission, which had to investigate the proposals of a World Food Council, were discussed together with proposals from the Executive Committee of the F.A.O. and various amendments in this respect proposed by the United States of America, the United Kingdom and Australia.

After prolonged discussion it was ultimately decided to establish an F.A.O. Council to replace the previous Executive Committee. The most important difference between the two bodies is that the F.A.O. Council will consist of government representatives of eighteen member nations, while the previous Executive Committee had thirteen members elected in their personal capacities. Furthermore, the F.A.O. Council will have an independent chairman, and the well-known Lord Bruce, formerly Prime Minister of Australia, was the first to be appointed to this position.

The Union of South Africa was in the fortunate position to be elected as one of the eighteen member countries of the F.A.O. Council, viz. for a period of three years. The last-mentioned ruling was decided on by ballot, namely six members for one year, six for

two years and six for three years. The Union Government has already appointed its representative on the Council, namely Dr. P. R. Viljoen, who has been the Union's representative on all the F.A.O. Conferences, and who is therefore thoroughly acquainted with the work of the Organization. He was also one of the thirteen members of the previous F.A.O. Executive Committee appointed in their personal capacities.

Conclusion.

Briefly it can be stated that the Conference can generally be regarded as highly successful, and fruitful work was done. Whereas previous Conferences concentrated on the administrative aspects of the Organization, the present Conference was in a position to focus its attention more particularly on the method of solving the world's great problem of increased production. In other words, the problem itself could be concentrated on.

The F.A.O. is already well on its way and efficiently equipped to accomplish its colossal task. Whether it will succeed will depend on the amount of support, loyalty and sympathy extended by member-nations. Judging from the spirit of goodwill and co-operation which prevailed at the recent Conference, such a possibility does not seem to be excluded.

The Production of Maize :—

[Continued from page 856.]

Rotations.

Although our knowledge concerning the value of rotations from a fertility point of view is somewhat confused owing to the conflicting nature of experimental results, the interests of mixed farming, proper farm management practices and the control of diseases and pests demand that maize should not be grown exclusively and continuously on the same land year after year, but that it should be rotated, preferably with some or other suitable legume. At least one-third to one-fourth of all the available arable lands should be devoted annually to legumes such as cowpeas, soya beans, field beans or groundnuts. The legumes receive no fertilizer, but follow on maize lands that were fertilized during the previous two seasons at the rate of 300-400 lb. per morgen. Maize (plus fertilizer) follow again after the legumes. Thus a simple three-year rotation can be adopted, namely (1) maize plus fertilizer, (2) maize plus fertilizer, (3) legumes without fertilizer. Once every three years each land would have had two dressings of fertilizer and once the beneficial effect of the legumes. Four or five-year rotations can be also planned that include other crops such as potatoes and teff, manna, or sudan grass. In the case of lands that have already been excessively exhausted, it will be advisable to devote one-fourth of the lands to a semi-permanent grass such as Rhodes grass, while a simple three-year rotation of maize, maize, legume is followed on the remaining three-fourths of the lands. After 3 years the Rhodes grass is ploughed out and re-established on another fourth portion of the lands. If the maize and other crops are grown on strips between suitable contour ridges and rotated with Rhodes grass as suggested, the fertility of the soil can be maintained on a fairly high level, while soil erosion will at the same time be checked to a large degree.

The Litchi in South Africa.

II. Cultural Practices and Marketing.

**Dr. Raimund H. Marloth, Officer-in-Charge,
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LARGE-SCALE commercial litchi growing in the Union may be said to be only a recent development, and consequently there is still much to be learned as to details of cultural methods which will result in best tree growth and the regular production of heavy yields of best quality fruit. Practical experience with relatively small plantings on only certain soil types and under certain climatic conditions will have to be the best guide for the litchi grower participating in this rapidly developing phase of subtropical fruit growing until such time as results from scientifically conducted experiments become available.

Planting.

The litchi tree is long-lived and grows to a large size in relatively few years; ages up to 800 years are claimed for trees still thriving in China, so that in planting full provision should be made for later growth of the tree. (Note size of tree in the illustration.) On sloping lands the lay-out should be on the contour so that terraces can be built up and surface sheet-erosion, with consequent exposure of the surface roots, prevented.



Litchi orchard eight years old with trees spaced 40 feet apart. Note scaffolding around trees.

Trees should be spaced not closer than 40 feet apart, and under best growing conditions 50 feet is preferable. When the spreading branches of adjacent trees interlace or even touch, there is a large reduction in flower production in such areas. Full exposure of the whole of the outside of the tree to sunlight is necessary. It is usually found that litchi trees take a number of years to "get away". This period can be reduced considerably if large planting holes at least $2\frac{1}{2}$ feet deep and $2\frac{1}{2}$ feet in diameter are dug some months before the trees are to be planted and liberal amounts of compost or well-rotted kraal manure thoroughly incorporated into the soil with which the hole is

again filled. The tree itself is planted by retaining the soil after removal from the tin in which it has been established as an unbroken "ball". Partial shading of the tree and regular watering until new growth made after planting has hardened will minimize planting losses and result in early vigorous main growth.

Supports.

It is stated by Groff (1943) that in China the litchi tree can withstand typhoon storms of 75 to 100 miles per hour, which blow in late summer, without suffering much damage. It must be that when the tree is grown under the high humidity climatic conditions of Canton, the wood is very much more resilient than when grown under climatic conditions pertaining in the Union, for it is well known, particularly in the Lowveld, that the wood of the litchi tree is far more brittle than that of other fruit trees, and branches break easily, especially in heavy winds or in later years when tree climbing is done to facilitate fruit picking. A cheap and effective form of support to counteract the effect of strong winds on young trees until about eight to ten feet in height can be provided by a form of tripod consisting of from three to five wattle or thin bluegum poles erected around the tree, the apex being fastened with wire in the centre at tree-height and the base entering the ground at tree-drip. As the tree gets larger it will be necessary to erect a frame of heavier poles around the tree. Four corner poles treated for protection against decay and white ants are joined with cross-poles.

This structure not only prevents branches from breaking, but enables pickers to stand on it and reach the fruit on the upper parts of the tree. Also, if propagation is being done, the cross-pieces are used to carry the water-container and for attachment of the marcottes so that they are held in the correct position and kept stationary.

Fertilizers.

There are few soils in litchi-growing areas in the Union which are so fertile that trees growing in them will not benefit from the application of fertilizers right from the start. The first application should be made in the planting hole, but some months before the tree is planted, otherwise the roots might be burnt. As it is desirable to bring the tree to a large size as early in life as possible, annual applications should be made thereafter. No knowledge is available as to the specific requirements of the litchi for the three main fertilizing elements, nitrogen, phosphorus and potash, but experience has shown that the application of kraal manure, which embodies all three of these, gives excellent tree response, and might be considered a suitable equivalent of the night-soil used by the Chinese on their prize litchi trees. The kraal manure, applied at the rate of 50 lb. for young trees and up to 500 lb. for large trees twenty or more years old, should be spread over the whole area in which roots are growing, as well as under the tree right up to the stem. This is then worked into the soil by means of hoeing and/or discing. Since the litchi is shallow-rooted and has most of its feeding roots near the soil surface, the plough has no place in the orchard, and shallow discing or harrowing to control weed-growth and the drawing of furrows for irrigation is all the additional soil cultivation which should be given when no cover-crops are grown. The specific value of cover-crops for the litchi has not yet been investigated, but since it is known that the litchi responds well to liberal amounts of humus in the soil, and since the beneficial effects of cover-crops

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on most of the soils in subtropical areas for other tree and annual crops has been fully demonstrated, it should follow that summer cover-cropping should be a normal practice in the litchi orchard. The application of superphosphate before the cover-crop is sown, especially if sunn hemp is used, will result in a marked increase in the bulk of green matter produced. When a cover-crop is grown, the annual application of kraal manure can be made just before the crop is turned under, thereby saving one discing operation.

Irrigation.

Unless there is an annual rainfall of at least 50 inches, *effective and distributed throughout the major portion of the year*, irrigation must be practised if normal crops are to be obtained. Under no circumstances should the litchi tree ever be stinted of water. In irrigating, it should be endeavoured to obtain a complete wetting of the soil down to at least four feet over 100 per cent. of the soil surface, for which purpose about 4 inches of water will be required if the soil is dry. Care should be taken that the top foot or two of soil is not water-logged for an undue length of time. Of course, if the trees are planted in such a situation that the main roots are in some underground supply of moving water, then the requirement of the amount of water necessary in the form of rain or irrigation is lessened considerably. In order to obtain an even distribution of water over the whole of the soil surface, particularly under the low-hanging branches of the tree, it appears that the best manner of applying irrigation is to use the 100 per cent. basin or the basin plus furrow methods. Care should be taken that the basins under the trees are absolutely level, and, when trees on a slope are terraced, all the basins should have level floors.

A comprehensive combined irrigation and fertilizer experiment on bearing litchi trees has been started by the research staff of a private estate in the Lowveld, and until such time as results from this are obtained, the general recommendations given in the foregoing paragraphs on fertilizers and irrigation should be applied by growers.

Diseases and Pests.

The litchi tree itself is singularly free of diseases and pests in the Union. Mineral deficiencies, as reflected by leaf symptoms and lack of normal growth, are physiological disturbances or diseases which have been noted, but the facts about them have not as yet been determined; in areas where citrus trees evidence zinc deficiency litchi trees have apparently benefited from a zinc sulphate-hydrate¹ lime 8:4:100 foliage spray, even though the litchi leaf deficiency symptoms resemble more the magnesium than the zinc deficiency symptoms of citrus, being more bronzing than a mottle leaf. The only tree pest recorded is that of a borer originating from a moth; the damage on the main stems is mostly superficial, and the borer can be controlled by brushing off the workings, killing the borer in its burrow with a piece of wire or by injecting raw linseed oil, and then painting the whole with a raw linseed oil-Bordeaux paste.

While still on the tree, the fruit is subject to attacks which in some years result in considerable loss. Under certain climatic conditions a large proportion of fruit exhibits brown areas on the shell. Such areas not only detract from the later appearance of the fruit when marketed, but also appear to be associated with considerably more bursting of fruits than would be normal. Investigations

are in hand on this problem. Tentative preliminary trials in which the trees were dusted with various fungicides some few weeks before the fruit is picked lead to the belief that the later incidence of wastage of fruit after picking and during transit to market can be reduced considerably. A moth, *Argyroplote peltastica*, closely related to the false codling moth, may cause from 2 per cent. to 5 per cent. damage to fruit once it has sized up, for the moth lays its eggs on the shell of the fruit and the hatched larvae enter through breaks or weak spots in the shell; infested fruit are difficult to detect during grading and packing. Consequently, until a practical and economical method of control is worked out, the nuisance value of this pest will remain considerable. The false codling moth also attacks the litchi, but its incidence is usually relatively low. Fruit-fly infestations have been reported from Natal, and also in oversea countries, but have not yet been found in the eastern Transvaal.

The greatest loss of fruit from disease occurs after harvesting, being mainly wastage rots due to *Rhizopus nigricans*, a species of *Penicillium*, a *Pestalozzia*, and a yeast-like organism. These all thrive under warm and moist conditions, and thus from the time of harvesting to being consumed fruit should always be kept dry, well ventilated, and cool. Preliminary trials during the 1946-47 season showed that such wastage could be reduced by half through treatment of the fruit in the packhouse by dusting with a certain proprietary non-metallic fungicide, which is a tetra-chloro-para-benzo-quinone by-product in the manufacture of synthetic rubber, and which in limited quantities is harmless to humans. Particularly in view of the early resumption of export, investigations are being continued to evolve practical treatments which will result in the reduction of wastage to a negligible amount.

Fruit Harvesting and Marketing.

The litchi fruit ripens in mid-summer. Since the ripening is such that all the fruit from any one particular variety generally ripens during the short space of a month or less, wherever practicable spot-picking at least every few days should be done. The state of ripeness at which the fruit is picked is usually gauged by the colour and final swelling of the fruit, as indicated by the extension of the small scale-like sections which constitute the shell.

Fruit quality maturity studies by the writer showed that the fruit of the Mauritius type, when picked ripe, consists of 15 per cent. by weight of shell, about 15 per cent. seed, and 70 per cent. edible flesh. A few days after picking the proportions change through drying out, so that the fruit purchased by the consuming public in towns has 9 per cent. shell, 10 per cent. seed, and 80 per cent. flesh, of which 55 per cent. is juice. Fruit picked at various stages of ripeness and stored showed that during the ripening process the acid in the juice decreased and that the soluble solids (mostly sugar) increased, this change being relatively rapid in the last two weeks of ripening, until at maturity the acid was about 1 per cent. and the soluble solids about 18 per cent. During storage of up to three weeks the acid gradually decreased to about half, while there was no change in the amount of soluble solids. It was found that fruit picked too early must be considered immature and of poor eating quality, being tough in texture and tart in flavour.

The litchi fruit in experiments conducted did not respond to artificial ripening on treatment with ethylene gas, so that this method cannot be used to replace the normal process on the tree.

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Fruit quality tests on a number of varieties at tree-ripe stage show that they differ considerably, the differences being constant for each variety. The following ranges were determined:—Weight per fruit, 12 to 24 grammes; seed weight, 6 per cent. to 18 per cent.; shell weight, 8 per cent. to 22 per cent.; juice, 46 per cent. to 65 per cent.; acid, 0.07 per cent. to 1.1 per cent.; and soluble solids, 16 per cent. to 24 per cent. Naturally no one variety had all the most desired values in these determinations, and an exceptionally good quality in one variety was usually off-set by some undesired factor. However, sufficient evidence was obtained to show that varietal differences will have to be taken into consideration in the harvesting and marketing of the fruit in later years if such varieties are planted on a commercial scale supplementary to the Mauritius type.

In harvesting, the fruit is broken off the tree in bunches a foot to eighteen inches long, and placed in trays or lug-boxes for conveyance to the packhouse. Even individual fruits should be picked by breaking them off with a length of stalk attached, for the shell is easily broken at the point of juncture with the stalk, and such breaks allow the easy entrance of fruit-rotting fungi. Fruit on the tree which is wet from dew or rain should not be picked until dry, or at least until no free water is present on the leaves or fruit, otherwise considerable wastage will result unless the fruit is dried by spreading it out on wire trays in the packhouse before packing; this is undesirable as during the drying the attractive fresh colour of the fruit disappears and the shell browns.

Packing.

Litchis are usually packed in trays, either as single fruits or in bunches. The use of tomato trays is not recommended, as when bunches are packed there is too much waste space and the fruit is shaken around too much, and if loose fruits are packed they must be in several layers and it is difficult to obtain a pack which will travel well and open up with an attractive appearance. The best pack is obtained with the use of the 18 in. by 24 in. fruit tray, a 3½ in. depth being used for bunches and 2 in. depth for single fruits when packed in a single layer. Double-layer packs of individual fruits in 3½ in. trays are also used, especially for export, in which case a sheet of good quality parchment or similar paper should be used between the two layers. The sides and bottom of the trays should be lined with woodwool. Before lidding, a sheet of paper is placed over the fruit and a thin layer of woodwool placed on top of that. Cleats should be used on all trays. The whole pack should not be too tight, particularly if the fruit is intended for export, so that the maximum air circulation between the individual fruits can be obtained while yet not allowing movement of fruits when the tray is handled. The use of attractive cellophane wrappers or bags for individual bunch packages or for a fixed number of loose fruits in a tray is gaining favour, but these wrappers or bags should have a reasonable number of perforations in them to allow air to circulate, thereby reducing the amount of waste which is liable to occur under closed-air, moist conditions. There should always be a fixed number of fruit in a tray, this number being indicated on the labelled end. Loose fruits usually go 144 to a single-layered tray, either singly in rows or in six packets of 24 each, while bunched fruit could be packed in eight packages of 20 fruits each, the net weight of fruit being about 8 lb.

Marketing.

It is only in recent years that the litchi has become available to the general public through increased sales on the market. When production was relatively small, the major part of the crop was disposed of through private orders and through export to England. It is believed that the figures for 1943-46 for the number of trays sold on seven of the principal markets in the Union, as given in the accompanying table, reflect only a third to one half of the number of trays actually marketed throughout the country.

*Litchis sold on Seven Principal Markets in the Union * (Johannesburg, Pretoria, Cape Town, East London, Port Elizabeth, Bloemfontein, Pietermaritzburg. No sales at Durban municipal market, heavy local production being sold by hawkers).*

Year: January-December.	Number of Trays.	Value.	Average Price per Tray.
		£	s. d.
1938.....	4,530	260	1 2
1939.....	9,902	442	0 11
1943.....	20,765	3,769	3 8
1944.....	20,632	4,801	4 8
1945.....	25,191	6,554	5 3
1946.....	41,384	9,512	4 7

* Compiled from data kindly supplied by Division of Markets and Economics.

The proportion of the crop being sent to these principal markets is increasing, and during the 1946-47 season, when 40,000 trays were sold on these markets, the Johannesburg market alone disposed of 18,000 trays, at an average price of 4/9 per tray.

Another feature change in the marketing of litchis in the Union is that while only a few years ago the first fruits did not appear on the markets before the middle of December and supplies ceased after the middle of January, the 1946-47 season extended from 24th November to 12th February. This is partly accounted for by the fact that extensive plantings in the warmer areas of the Transvaal Lowveld—where the fruit matures one month or more before that grown in the older established plantings in Natal and in the eastern Transvaal—have come into bearing. As yet there has been no appreciable lengthening of the season at the end, but this might be accomplished if and when later-maturing varieties have been proved and are planted commercially. At present the prices charged by retailers for the fruit is too high to enable the litchi to compete with the deciduous fruit which arrives in quantity from the western Cape Province after the New Year, but there is a definite increasing public demand for this fruit, and an extended marketing season should be aimed at so that the greatly increasing quantities being produced can be available to the public at a reasonable price over a longer period. Accompanying this, there should be a wider distribution to the smaller markets in the Union, for there are many of these which have never received any consignments of this fruit, and a very large potential consuming public awaits the growers who give the necessary study and attention required in these days of competition to the marketing of their products.

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Export.

The first export of litchis to England was made in 1927, and since then up to 1940, i.e. after the war had started, increasing quantities were shipped, as is shown in the accompanying table.

Litchi Exports.

Season.	Shipping tons.	Equivalent in single-layered trays.	Season.	Shipping tons.	Equivalent in single-layered trays.
1927-28.....	12	960	1934-35.....	101	8,080
1928-29.....	2	160	1935-36.....	21	1,680
1929-30.....	1	80	1936-37.....	155	12,680
1930-31.....	5	400	1937-38.....	182	14,560
1931-32.....	10	800	1938-39.....	364	29,120
1932-33.....	24	1,920	1939-40.....	150	12,000
1933-34.....	40	3,200	1940-41.....	Nil	Nil

In view of the fact that the saturation point on the London and English provincial markets was so easily reached because the litchi is so little known to the consuming public, the Litchi Exporters' Association was formed in 1934. Although at that time there were only two main litchi exporters, the Association aimed at the protection of all litchi growers' interests, such as the gathering of knowledge for the more successful growing of the fruit, the popularizing of the fruit both in the Union and overseas, the widening of markets, and the more orderly marketing of the crop. It is expected that export might be restarted during the 1947-48 season and in view of the tremendous increase in crop which will be available for disposal and the increase in number of litchi growers it might be considered opportune for the re-establishment of the Association or an organization having similar aims. If best returns are to be obtained for growers, the marketing, and especially export marketing, of this fruit should be developed along sound lines.

The litchi fruit is very susceptible to storage rots, and even before the fruit was loaded into the ship 12 per cent. of arrivals at the ports was rejected, two-thirds of these on account of wastage. Whether the fruit treatments being investigated and referred to under Diseases will greatly assist in reducing this wastage in export packs will not be known till trial shipments have been sent overseas. In the meantime, careful handling of the fruit during picking and packing, vigilance to ensure that no moist fruit is packed, avoidance of too tight a pack of woodwool, and the use of a single-layer or double-layer individual fruit pack as recommended by the Government Chief Fruit Inspector should be the rule for all fruit to be exported. If trays are wired together to form larger single packages then such packages should not consist of more than five single-layer or three double-layer trays, otherwise the package is likely to receive rough handling by the stevedores because of its weight.

By-products.

The main by-product of the litchi is the fruit in its dry state. In China a very large proportion of the crop is dried and "Chinese Nuts" are always associated with the Chinese New Year the world over. Sun-dried fruit is claimed to be superior to that dried by means of artificial heat, but with the modern methods employed in dehydration factories there should be no reason why fruit subjected

to a modified dehydration should not equal the best sun-dried fruit. The flavour of the flesh of dried litchis is likened to that of a very superior quality raisin, but is sweeter, with a characteristic flavour of its own. In China the bunches of fruit, after picking, are hung on wire trays in the sun, being brought indoors at night and when rain or mist threatens. Small-scale experiments in the Union on drying the Mauritius type of litchi showed two main difficulties in obtaining a satisfactory first-class product. First, not only did initial waste occur in an unduly high percentage of fruit, but it was also found that in the final dried product a great amount of mould not visible on the outside shell occurred inside on the flesh. Secondly, the flesh of the Mauritius type tends to be far tougher than that of the Madras type when dried. It is not known whether the Chinese differentiate in the varieties which they use for drying.

Mrs. Westgate in Higgins (1917) gives recipes for other uses of the litchi fruit, such as the making of litchi sauce, sweet pickled litchi, spiced litchi, and canned litchi. The canning of litchis on a commercial scale, as is done in China, offers distinct possibilities in the Union, but this will only be possible when fresh-fruit production has increased to that degree where the prices realized for fresh fruit have fallen far below their present level.

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Seed Potatoes.

The public is requested to take notice that the Seed Potato Growers' Union still has at its disposal approximately 60,000 bags of good certified seed potatoes obtainable on request from the Secretary of the Union, P.O. Box 8, Hartbeesfontein, Western Transvaal, at the prices fixed by the Union. Arrangements are also being made to leave the importation of fresh seed potatoes from oversea in the hands of the trade, as was the case before the war.

Persons interested in potato production must apply in good time to the import agents or the Seed Potato Growers' Union in order to avoid disappointment.

To obtain the best results from such good seed potatoes, producers should also make timely arrangements for their fertilizer requirements and should cultivate their lands and have them in good condition for planting in good time. Persons who are uncertain about the requirements for good cultivation should consult the Extension Officer of their district or the Regional Office in their area.

D. J. v. d. Berg, Field-Husbandry Officer, Division of Soil Conservation and Extension).

Wilt Disease of New Zealand Flax.

Dr. Vincent A. Wager, Officer-in-Charge, Botanical Station,
Durban.

EARLY in the war a thriving fibre industry was ruined by a fungus disease. Owing to the shortage of paper and printing facilities at that time, and the fact that there was only one producing plantation of this fibre-plant (*Phormium tenax*) in the country, the results of the enquiry into this disaster were not published.



FIG. 1.—A field of *Phormium tenax* destroyed by wilt: very few plants have survived

At present, South Africa is faced with a severe shortage of bags and the production of fibre of any sort is thus a matter of major importance. As *Phormium tenax* seems to be one of the most promising fibre crops, plans are under way for its production on a large scale. About 1,500 acres are being planted out at Melmoth in Zululand, and this acreage will be greatly extended in the future.

It seems advisable, therefore, to place on record the details of a disease, which, under certain conditions, caused such destruction.

History of the Disease.

In 1936 a company at Umhlatuzi, Zululand, commenced planting *Phormium tenax*, and, by 1942, some 300 acres were well established. An up-to-date fibre extraction machine (decorticator) had been especially imported from New Zealand and a high quality flax was being produced and marketed. The whole venture had been highly successful and there was promise of a flourishing industry that could be greatly expanded as there were thousands of acres adjacent where flax could be grown.

This land was flat, 15 to 25 feet above sea level, and bordered Richards Bay, a lake or lagoon some 15 miles wide, fed by the Umhlatuzi River, and opening to the sea through a narrow channel. The average annual rainfall was around 56 inches. Unfortunately, in times of floods, which were not rare, and especially if these coincided with a high tide, the level of the lake rose to such an extent that the adjacent country was flooded, often to a depth of 7 feet or more, and it might be a few days or weeks before the water receded and escaped out to sea.

In May 1940 the flax fields were flooded to a depth of 3 feet and shortly afterwards the disease was noticed for the first time as an occasional wilted plant here and there.

The following year, 1941, was a dry one with only 31 inches of rain, and very few, if any, further cases of wilt were seen.

In 1942 there were 30 inches of rain in the first 3 months, flooding again taking place, and by April the disease had appeared and thousands of plants were dying. The writer was then called in to investigate it. After this first flush of the disease very little more occurred during the rest of the year, which was comparatively dry.



FIG. 2.—Severely infected plants appear as rosettes of white leaves lying flat on the ground.

In 1943 there were again heavy rains, some 40 inches in the first 4 months, and again frequent floodings. By May the plants were dying wholesale. From 60 to 80 per cent. of most of the

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plantings were dead or wilting, and this flourishing industry had collapsed and was abandoned. The decorticator was dismantled and sold and the *Phormium* fields were ploughed up and planted to other crops. The investigation also came to a sudden end.

Growth of *Phormium* on the Flats.

The original planting of *Phormium tenax* was at Melmoth, some 40 miles inland, on hillsides, where 70 acres have been established since 1932. No wilt disease has ever been seen in this planting. "Fans" or "sets" were taken from Melmoth to plant all the acreage at Umhlatuzi. Before the disease appeared, it seemed that the flats were eminently suited to flax, for the plants grew larger, more luxuriantly, quicker, and gave a better yield and better quality fibre than those growing at Melmoth.

Soil Conditions.

When the first examination of the flax fields was made in April 1942, the weather had been dry for about a month following the recent flooding. The soil was black alluvial loam, and in holes dug in it, it was found to be very wet at one foot depth and water seeped into the holes at two feet depth. On slightly higher ground, the soil was gray, more granular, and drier, but at two feet it was very wet with water seeping into the holes at three feet.



FIG. 3.—An isolated infected plant surrounded by healthy ones.

According to the Division of Chemical Services the acidity of this soil varied from pH 4.6 to 5.

Appearance of Infected Plants.

An examination of a badly infected plantation showed a scene of devastation. In all directions plants had collapsed and appeared as rosettes of white leaves lying flat on the ground. In 1942, after the first serious outbreak, some fields had up to 30 per cent. of

the plants already dead with the majority of the remainder showing various degrees of infection.

The roots of an infected plant were dead, rotten or discoloured. The discoloration passed from the root into the rhizome, changing it from normal white to yellow or brown. The rot spread up the outside of the rhizome, attacking leaf bases successively, causing them to turn brown and rot, so that the leaves, still turgid and green, fell over, or could be easily pulled away from the plant. When the disease progressed more slowly, the leaves turned yellow in colour. In the early stages the leaf bases showed lesions of brown and rotten tissue up to 3 inches in size.

During its growth, the original fan gave rise to others so that an old plant consisted of a large cluster of fans. Thus, one or more fans of one plant might be infected while the rest remained healthy. While wet weather continued, more fans became affected until all had collapsed, but if dry weather followed, the progress of the disease appeared to be arrested. The lesions dried up, appeared to be isolated from the remainder of the tissue by a layer of cork, new growth was perfectly healthy, and the only residual effect was that the plant was smaller than the adjacent ones. With the recurrence of a spell of wet weather these plants usually showed renewed infection and succumbed.

Cause.

Cultures were made from all infected parts of numerous plants in all stages of infection and in the majority of cases a *Fusarium* developed. Occasionally *Rhizoctonia solani* and *Colletotrichum* sp.* were also obtained.

The *Fusarium* cultures all appeared to be the same and were sent to W. Snyder, University of California, who replied "... these cultures are members of the species *Fusarium oxysporum* as used by us in our paper in the American Journal of Botany 27: 64-67, 1940 . . . I see no reason why it should not be named *F. oxysporum* forma *Phormii* as you suggest, providing you are satisfied that the fungus causes a vascular disease of *Phormium tenax*."

Inoculation Experiments.

Fans obtained from plants in the healthy Melmoth locality were planted in 5-gallon drums of sterilized soil. When they were well established, half of them were inoculated either by placing the *Fusarium* in wounds at the base of the stem or by digging the fungus into the soil. The remaining plants were uninoculated controls. All were watered somewhat more than was necessary.

After periods varying from 1 to 6 months or more, approximately one-quarter of the inoculated plants developed typical

* This *Colletotrichum* was similar to others isolated from a disease of the leaves, which appeared in two forms: (a) a dying-back of the tips for a distance of a few inches to a few feet: these portions turned white and were covered with minute black pycnidia: (b) lesions on otherwise healthy green leaves, which started as red blotches with a light green or yellow area surrounding them: the blotch increased in size, the centre became white and parchment-like with pycnidia all over it, and the edge of the lesion was light red or brown.

This disease was not serious, but was an aggravation as leaves with these diseased areas would not process properly in the machine.

The fungus was identified by E. W. Mason, Imperial Mycological Bureau, Kew, as *Glomerella phacidiomorpha* (Ces.) Petr., the perfect stage of *Colletotrichum rhodocyclum* (Mont.) Petr.

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symptoms of the disease and slowly died. The *Fusarium* was again isolated from various parts of the infected plants and appeared to be identical with the original culture. These inoculation experiments showed that, although the fungus was capable of producing wilt in healthy plants growing under healthy conditions, it was apparently not a virulent parasite.

The field evidence seemed conclusive that a very wet soil condition was the main contributing factor, the disease developing rapidly under such conditions. During the comparatively dry weather of autumn, winter and spring, during both the years 1942 and 1943 that the disease was under investigation, its progress appeared to be entirely arrested.

It was also very evident whenever one walked through the flax fields that plants growing on humps, ridges or higher portions of land were not affected by the disease. There was one striking case in a field of 13 acres where the land for some 40 yards was higher than the rest. On this portion there was a dense stand of robust plants. The rest of the field suddenly dropped away a foot or so and from this line of demarcation it looked as though a fire had passed through, probably 90 per cent. of the plants being dead or severely infected. However, odd plants wilted even in higher spots and adjacent to luxuriantly growing, perfectly healthy plants.

The disease was always much worse in fields or portions of fields which had just been cut. This might be explained by the fact that transpiration from the greatly reduced leaf surface was insufficient to cause any appreciable movement of water stagnating around the roots.

Infected Plants for New Plantings.

At first the company decided to replace blanks in infected fields with surviving plants from a badly infected field.* Most of such plants had shown disease but had recovered. This procedure was a failure for most of these transplants also died.

To test this point, some 50 of these fans were planted in drums of sterilized soil at the laboratory. Although they appeared healthy when planted, all subsequently wilted and died. This experiment was repeated with the same results, showing that the fungus was apparently present in fans from infected plants, and possibly the damage sustained in transplanting induced rapid development of the fungus.

Drainage Experiments.

As the high water table, and flooding, appeared to be the contributory cause of the disease, it was decided to put down a series of drainage ditches in some of the plantings. These ditches were dug 4 feet deep, parallel to one another, and 12½ yards apart. There were 4 rows parallel to, and between, each ditch.

Twelve rows in the drained areas (2 rows alongside of each of 6 ditches) and 4 rows in the centre of an adjacent undrained portion were marked off and each plant (or gap indicating where a plant had died) was labelled. There were 60 plants in a row, making a total of 960 plants.

The individual history of each plant could then be determined at 5 examinations during the following year.

The results of 4 lines each of the drained and undrained sections are given in Table 1. The results indicate how the disease flared

* A 20-acre field with 1,200 plants per acre, with 30 per cent. infection, would require over 7,000 reffils. The purchase price is £6. 0s. 0d. per thousand.

up during the excessively wet period, and how practically no new cases occurred during autumn and winter, but that some of the infected plants got worse and died. These figures give a very good indication of conditions prevailing throughout the plantings.

A second drainage experiment was carried out in another block where the ditches were 25 yards apart in a chess-board pattern. Plants were marked off in the same way as above and examined at the same intervals. The results were comparable.



FIG. 4.—The discoloured rotten areas at the base of each leaf.

Photos by V. A. Wager.

The drainage scheme was a failure owing to the fact that the water could not get away. As soon as the drainage ditches were cut they filled with water, and this water level varied from 6 inches to 3 feet below the surface of the soil, depending on the contours of the land. There was so much water, the slope so gradual, and the flow so slow that there was very little change in the water level. When heavy rains and high tides raised the level of the lake, the water pushed back up the drainage ditches, usually resulting in general flooding. Closing the gates in the dykes which enclosed the property certainly kept back the flood waters but allowed of no outlet for the accumulating waters within.

There appeared to be no solution to the drainage problem or the menace of future floods. The disease seemed to be associated with the occasional waterlogging of the soil, and as no other means

WILT DISEASE OF NEW ZEALAND FLAX.

TABLE 1.—Showing the Numbers of Plants that were Dead or Diseased at Each of Five Examinations.

Number.	MAY 1942.				SEPTEMBER 1942.				DECEMBER 1942.				MARCH 1943.				MAY 1943.			
	Out of 60 Plants.		Total Per-centage.		Out of 60 Plants.		Total Per-centage.		Out of 60 Plants.		Total Per-centage.		Out of 60 Plants.		Total Per-centage.		Out of 60 Plants.		Total Per-centage.	
Drained Rows..	7	9	27		12	4	27		13	6	32		13	22	75		17	32	82	
	6	12	32		9	11	35		11	9	33		11	32	72		18	30	80	
	8	19	45		12	15	45		14	17	52		17	25	70		26	17	72	
	9	16	42		12	14	43		15	18	55		17	21	63		23	16	65	
Undrained Rows	18	12	50		20	10	50		23	11	57		23	19	70		26	17	72	
	7	22	48		14	15	48		16	14	50		18	17	58		23	21	73	
	4	25	48		14	15	48		17	14	52		19	19	63		21	20	68	
	16	18	57		21	13	57		23	18	69		28	24	87		37	17	90	

TABLE 2.—Showing the Development of the Disease in the First Thirty Plants of Row II (eleven) in Table 1.
 . = Healthy plant. I = Slight infection. II = Medium infection. III = Severe infection. X = Plant is dead.

Date.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1942.																														
May.....	X	X	III	X	X	X	.	.	.	.	III	.	.	.	III	.	.	X	X	I	.	.	I	.	.	.	.	I	.	.
Sept.....	.	X	X	X	X	X	.	.	.	.	X	.	.	.	X	.	.	X	X	I	.	.	I	.	.	.	.	I	.	.
Dec.....	.	X	X	X	X	X	.	.	I	.	X	.	.	.	X	.	.	X	X	II	.	I	.	I	.	.	.	I	.	.
1943.																														
March...	X	II	X	X	X	X	.	II	II	II	X	.	II	II	X	I	I	X	X	III	II	II	II	.	.	.	I	III	II	II
May.....	.	X	III	X	X	X	.	III	III	II	X	.	II	II	X	I	I	X	X	X	III	II	II	.	.	.	I	X	II	II

of controlling the fungus was known, there was no alternative but to discontinue the production of flax.

Yellow-leaf Disease in New Zealand.

Phormium tenax is indigenous to New Zealand and at one time covered millions of acres of highlands. Nowadays the plant is found there growing wild only in low-lying swamp lands—areas too wet to burn and of little use for stock grazing or for cultivation ⁽¹⁾.

For many years a disease known as yellow-leaf has been recorded and has caused extensive losses. The plants turn yellow and die. The disease was investigated in 1920 by Cockayne ⁽²⁾ who stated that it occurred in dry areas, but that it was much more prevalent in swamp lands, where up to one-third of the plants were affected. He regarded the disease as being of an infectious nature and favoured by stagnant water.

In 1921 it was stated ⁽³⁾ that yellow-leaf had rendered some 6,000 acres unproductive. A fungus, *Ramularia phormii*, was considered to be the cause of the disease.

In 1922 Waters and Atkinson ⁽⁴⁾ stated that no conclusive evidence had as yet been furnished that the disease was of parasitic origin. The presence of the fungus was not in itself an indication of yellow-leaf, but that suitable conditions might convert it into a destructive parasite.

Apparently no further work has been done on this disease, for, in reply to a letter from the writer, the Director of the Fields Division, Department of Agriculture, Wellington, N.Z., on 2nd December 1942 stated that it was generally thought that the trouble was due to stagnant subterranean water, or something obnoxious to the plants contained in the subsoil: also, in many of the swampy lands extensive drainage resulted in the roots being left more or less without soil nutrition, thus causing wholesale yellowing and death of the plants.

There do not appear to be any other reports in the literature of a wilt or root disease of *Phormium tenax*.

- ⁽¹⁾ PETRIE, W.—New Zealand Flax: *Phormium tenax*. Roneoed Pamphlet, Department of Agriculture, New Zealand.
- ⁽²⁾ COCKAYNE, L.—Yellow-leaf Disease in *Phormium tenax*. *N.Z. Jour. of Sci. and Tech.*, Vol. III, 4, 190-196, 1920.
- ⁽³⁾ COCKAYNE, A. H.—Discussion on the Flax Industry. *N.Z. Jour. of Sci. and Tech.*, Vol. VI, 1, 34-35, 1921.
- ⁽⁴⁾ WATERS, R. AND ATKINSON, E. H.—Yellow-leaf Disease in *Phormium tenax*. Preliminary report on a current investigation. *N.Z. Jour. of Agr.*, Vol. XXIV, 1, 27-32, 1922.

Nursery Quarantines.

The following nursery was in quarantine as at 1 November, 1947:—

Mooiuitaig-Nursery, Private Bag, Nelspruit, on citrus (all) for red scale.

Concrete-Pipe Making and Laying for Irrigation.

W. Unkles, Farm Manager, Sub-tropical Horticultural Research Station, Nelspruit.

UNDERGROUND concrete pipe-lines can be used with advantage in orchards, or when water has to be conveyed over long distances and the nature of the soil makes the use of pipes advisable.

The comparatively high cost of installing pipe-lines in an orchard is offset by the following factors, particularly when the water supply is limited, and where pumping costs have to be considered.

- (a) No loss of water occurs through seepage or evaporation in transit.
- (b) Soil erosion is eliminated.
- (c) The making of pipes to be used for gravitation purposes can be done at comparatively low cost.
- (d) No interference is encountered by farm implements or vehicles.
- (e) No furrow maintenance costs are incurred.
- (f) Irrigation operations are facilitated and speeded up.

Concrete pipes are obtainable in many sizes, but only the 6, 8 and 10-inch pipes will be dealt with here, since these are the most common sizes used. They are obtainable from various stockists, or they can quite easily be made on the farm. Steel moulds, with the necessary fittings for making these pipes can either be hired or purchased for the purpose.

Plan of Lay-out.

It will be advisable when contemplating the introduction of a concrete pipe-system to draw a plan of the orchard or land to be irrigated. The contours should be shown on the plan since the differences in the levels largely determine the lay-out of the total pipe-line, the number of distribution boxes, sand traps, points of delivery, and the size of the pipes.

Unless the whole system is carefully planned beforehand, the farmer may be put to considerable expense subsequently should the rectification of mistakes become necessary.

Making the Pipes.

A level area within reach of water should be chosen as the site for making the pipes. Shade should be provided in order to ensure proper curing.

A concrete block 18 inches by 18 inches by 3 inches, placed at ground level near the mixing board, will provide a solid base on which to stand the mould. If a sack is placed on this base, any of the mixture which may be spilt during the filling of the mould can be collected and used again.

The concrete mixture used for pipes to stand up to a 25-foot head is: 1 part cement to $1\frac{1}{2}$ parts rock to 3 parts sand by volume. It is important to use only clean crushed rock or gravel. For 6-inch pipes, $\frac{1}{4}$ -inch crushed rock is used, and for 8-inch and 10-inch pipes, $\frac{1}{2}$ -inch crushed rock. Pit sand with a fair loam content is

most suitable. Sharp, clean river sand will not bind the mixture sufficiently and may cause the pipes to crack.

The water content of the mixture is an important matter, for the success of the pipe-making is to a great extent dependent on this

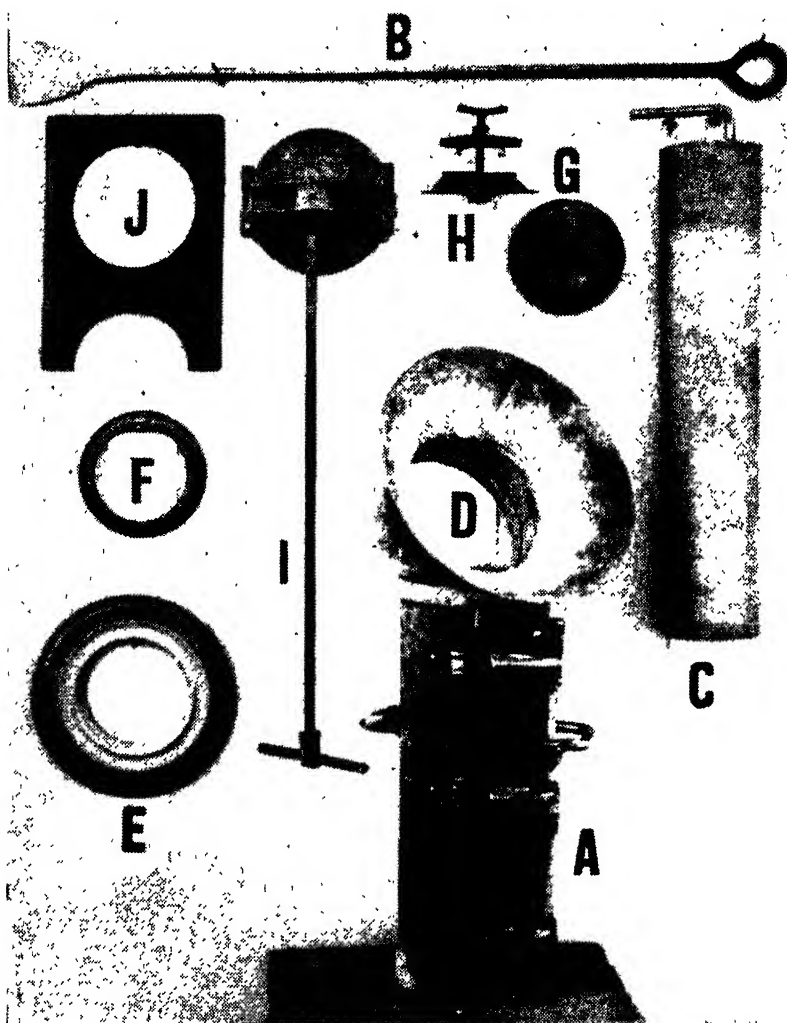


FIG. 1.—Pipe mould with accessories and fittings for pipe-lines. A, jacket; B, tamp; C, core; D, filler; E, rimmer; F, foot ring; G and H, two views of under-arch orchard valve; I, pressure gate; and J, pressure-gate frame.

factor. When a handful of mixture is squeezed, it should just form a ball. If used too wet, the pipe may collapse when the mould is removed immediately after filling.

To prepare the mould for filling, first place on the concrete block, referred to above, a foot ring (Fig. 1 F) with the groove-end at the bottom. Clamp the opened jacket (Fig. 1 A) onto this ring and slide the core (Fig. 1 C) into the jacket, inserting it into the foot ring, which is already held in position by the jacket. By

CONCRETE PIPES FOR IRRIGATION.

means of the lever the core is then expanded. Place the filler (Fig. 1 D) or funnel on the mould and commence filling and tamping, taking care that the core remains in the centre of the jacket. For this work 2 labourers can be used for making 6-inch pipes (Fig. 2). After having prepared the mixture one labourer places small quantities of mixture in the mould while the other continues tamping right round the core, always working in one direction. When larger pipes are made, three labourers may be required, two of whom do the tamping. (Tamp, B, shown in Fig. 1.)



FIG. 2.—Pipe-making in progress.

Remove the filler when the mould has been filled, and form the tongue-end of the pipe by means of the rimmer (Fig. 1 E). The rimmer fits around the core and by alternate tamping and spinning the desired form is obtained.

Pipemaking in Progress.

Move the filled mould immediately to the preliminary drying site, standing it on end on the foot ring and remove the jacket from the pipe. This is done by contracting the core by means of the lever, slipping a pipe ring over the core onto the pipe and pressing it down flush with the top of the jacket, in order to protect the tongue-end when removing the core. Pull the core out, open the jacket carefully by means of the lever until it is fully expanded, and remove it in a steady continuous vertical lift. Wash the core each time after using it, and remove any cement which may have penetrated into the groove, as an accumulation of material there may damage the core; also wash the interior of the jacket each time after use.

It is essential that the pipes be covered with wet sacks immediately they are made. If, in addition, the pipes are sprayed with water periodically during the day, stronger pipes will result. For this purpose a garden hose with a fine nozzle, locust pump, or even a watering can may be used.

The top ring may be removed as soon as the concrete has hardened somewhat. Allow the pipes to set for at least 12 hours before removing the foot rings and stacking the pipes for curing. Lay the pipes down flat and do not stack more than two layers during the first two or three days, after which the height of the stack may be increased. While the pipes are being cured, wet them periodically and keep them covered.

Prior to the laying of the pipes, which can be undertaken fourteen days after they are made, the interiors of the pipes should be bagged with cement wash, in order to provide a smooth surface and to seal any cracks. The mixture for this purpose should consist of three parts cement to one finely sifted sand or just cement alone, with enough water to form a flowing mass. Dip a piece of sacking attached to a short handle into this mixture, and rub the inside of the pipe in order to deposit a thin layer over the whole of the interior. A labourer on either side of the stack will facilitate the "bagging".

The approximate cost of making 2-ft. pipe lengths is summarized in Table I.

TABLE I.—*Approximate production and daily output.*

Diameter of pipe.....	6 inch.	8 inch.	10 inch.
Two labourers will make in one day...	100 ft.	80 ft.	60 ft.
Cement @ 3/9 per pocket.....	18/9 (5 pkts.)	18/9 (5 pkts.)	22/6 (6 pkts.)
Rock @ 15/- per cub. yd.....	4/2 (7½ cu. ft.)	4/2 (7½ cu. ft.)	5/- (9 cu. ft.)
Sand @ 7/6 per cub. yd.....	4/2 (15 cu. ft.)	4/2 (15 cu. ft.)	5/- (18 cu. ft.)
Depreciation on mould and fittings, ½d. per foot.....	4/2	3/4	2/6
Labour: Two labourers, 3/6 per day..	7/6	7/6	7/6
Cost per foot.....	4·6 pence.	5·6 pence.	8·3 pence.

On piece-work, two experienced native labourers can make 100 feet of six-inch piping in seven hours, including the mixing of the concrete.

Pipes which are not to be subjected to any pressure can be made with a much weaker mixture. For this purpose 1 part cement to 8 parts pit sand would be found strong enough, the cost of making being approximately 3·7 pence per foot.

Laying the Pipes.

The line along which the pipes are to be laid, should be staked out as straight as possible, the stakes being placed not more than 100 feet apart. In order to have a furrow of uniform width, it should be double staked. Strain two wires, each 100 feet to 200 feet long, on the outsides of the two rows of stakes. The top of the pipe-line should be at least 12 inches below the surface. The width of the trench should be sufficient to allow the workman to stand astride the pipe inside the trench during the laying operations. There should therefore be at least 6 inches clearance on either side of the pipe.

The bottom of the trench should be true to grade, and clear of all rock, clods and other materials that would interfere with the laying process. For this purpose boning rods are used, three of which would suffice. Note the position of the operator in Fig. 3 who sights over the nearest rod to the top of the most distant one, indicating to the holder of the centre rod, as he moves along the trench, where any adjustments in the depth have to be made in the level. The length of the trench "boned" at a time depends on the slope of the land.

CONCRETE PIPES FOR IRRIGATION.

Work each section according to the grade in that section. No point in the pipe-line should be lower than the outlet, especially when there is only a slight fall, since sand or silt may accumulate in the low-lying section and reduce the flow of water or even block the line.



FIG. 3.—Boning a trench.

When commencing to lay the pipes, place the first section with the groove-end at the intake. Clean and wet all concrete-pipe surfaces which will be cemented together. Fill the groove-end of the next pipe section to be laid with laying mortar, while the pipe stands in a vertical position in the trench (Fig. 4). To accomplish this, a laying core is pushed handle first into the pipe, so that the core projects about 6 inches.

The laying core is a cylinder about 12 inches long, made of flat galvanized sheet iron, and provided with a metal handle about 18 inches long. The flat iron is bent into the form of a cylinder, with the edges overlapping, but not soldered together. (See Figure 5).

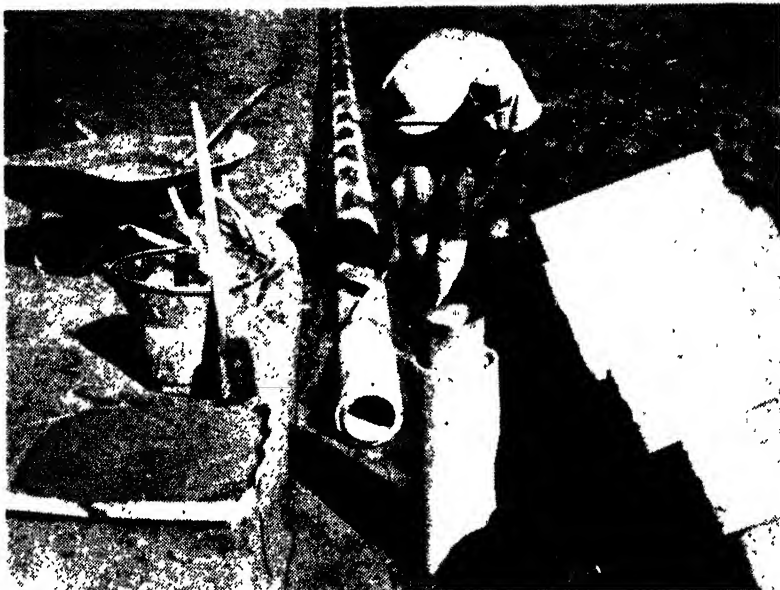


FIG.—4.—Laying concrete pipes.

To provide room for the collar around the joint, make a small excavation about 2 inches deep by 4 inches wide underneath the tongue-end of the pipe which has just been laid. Place the laying mortar in the excavation, and lower the pipe to be laid in position.

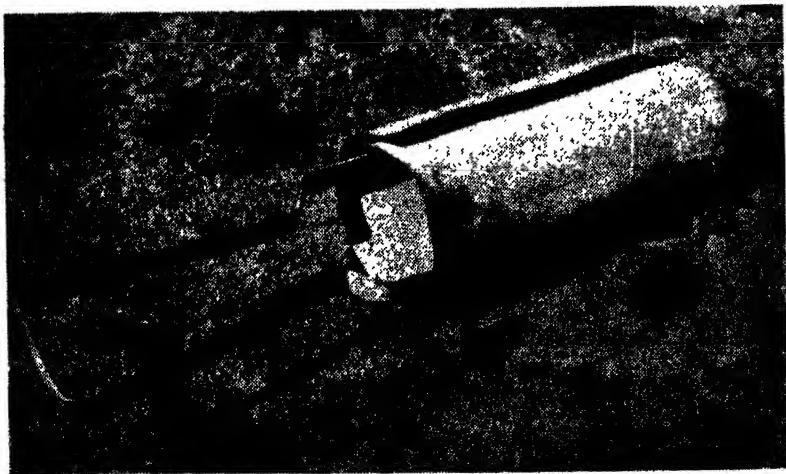


FIG. 5.—Diagram of the laying core, with metal handle rivetted on.

This is done most conveniently by one operator gripping the laying core, while the assistant lifts the other end. Insert the protruding portion of the laying core into the pipe already laid, taking care

CONCRETE PIPES FOR IRRIGATION.

not to drop any mortar from the core. Press the two pipe sections together until some mortar is squeezed out at the joint. Extract the core and align the pipe by means of the length of line previously stretched in the trench for the purpose. Apply mortar with a trowel for the collar, which should not be less than half an inch thick over the joint.

Particular care should be taken to make a thorough union between the collar and the mortar, which is laid in the trench under the joint, before the pipe sections are pressed together.

The interior of the pipe at the joint should be brushed clean and smooth with the brush shown alongside the bucket in Figure 4, and any surplus mortar removed. A shovelful of soil, free from stones or clods, placed on each side of the pipes at the joint and pressed in by hand, will prevent the collar from becoming detached before setting and also prevent the pipes from shifting out of position.

All completed joints should be covered as soon as possible with a little soil in order to prevent cracking due to too rapid drying. When the collars have set sufficiently, cover the pipe-line to a depth of six inches, as a preliminary measure.

Test the line in fairly short lengths for possible leaks and then fill the trench completely.

The approximate cost of laying pipes is shown in Table 2.

TABLE 2.—*Cost of laying pipes.*

Diameter of pipe.....	6 inch.	8 inch.	10 inch.
Three labourers will lay in one day...	160 ft.	130 ft.	110 ft.
Cost of digging trench in one day @			
3/6 per labourer.....	14/-	14/-	17/6
Labour for laying pipes; three @ 3/6	10/6	10/6	10/6
Cement @ 3/9 per pocket.....	7/6 (2 pkts.)	9/4½ (2½ pkts.)	11/4 (3 pkts.)
Sand @ 7/6 per cub. yd.....	1/8 (6 cu. ft.)	2/1 (7½ cu. ft.)	2/6 (9 cu. ft.)
Cost per foot.....	2.5 pence.	3.3 pence.	4.5 pence.

(N.B.—This does not include the cost and installation of fittings.)

The lower half of Figure 6 is a diagrammatic representation of a pipe-line showing a diversion box and several stand-pipes with under-arch valves.

In the upper half of Fig. 6 cross-sections of the stand-pipe and orchard valve are illustrated.

In Fig. 7 is shown a "close up" cross-sectional view of an orchard stand-pipe, main delivery line, stand-pipe, and distributing stand with 2 distributing gates with orchard valve in centre.

In Figure 1 (G and H) are shown two views of an under-arch orchard valve. A pressure gate and a pressure-gate frame, respectively, are shown as I and J.

Pressure gates are required in the pipe-line system to distribute or divert the water, and to block the line at certain points so that the water will rise through the under-arch or orchard valves and flow on to the land.

Whilst the pipes are being laid, gaps of 7 to 8 inches should be left in the main delivery line wherever gates are required. A gate frame is built onto the opening of the upper pipe when the object is to use the gate simply to stop the flow of water, and also onto the lower pipe at points of diversion.

A concrete or brick walling is built around the gap in the line and a large-diameter pipe cemented onto this, or a square concrete

box may be built up to the required height. This is done to prevent soil, grass or other material from getting into the pipe-line, and to stabilize the water pressure. The height should be just sufficient to prevent water spilling over.

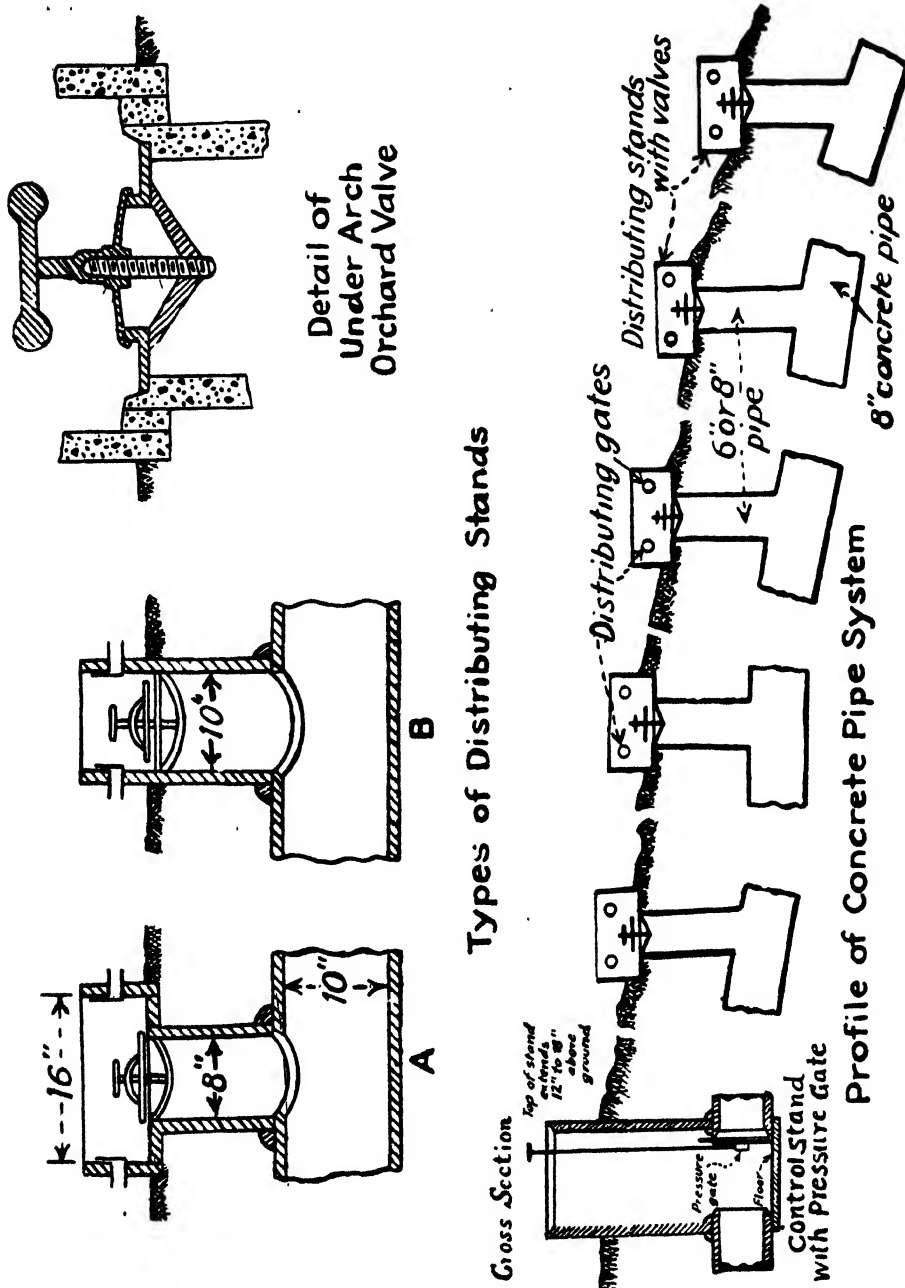


FIG. 6.—Fittings for concrete pipe-lines.

The pressure gate slides into grooves in the gate frame, and a twist of the handle clamps it in position. It is therefore possible to control the flow of water through or into a pipe-line by clamping

CONCRETE PIPES FOR IRRIGATION.

the gate in different positions. It is not necessary to provide a pressure gate for every gate frame installed; one may suffice for one or more stand-pipe gates.

Since the pipes are not reinforced, they are only able to withstand limited pressure. For pipes as described here, it is recommended that the head on the pipe be limited to 20 to 25 feet.

The intervals at which the gate frames should be installed for the pressure gates depends on the slope and head of water.

Should no gate frames or pressure gates be available, a stop plug made of strong canvas fitted onto a wire ring large enough to fit over the lower pipe can be made to get the water out of the stand-pipe. This method may be employed only on pipe-lines with some slope and cannot be used for the furrow method of irrigation



FIG. 7.—Cross-section of under-arch valve.

unless under-arch valves are fitted to the pipe-line. Under-arch valves should be fitted to the pipe-line at points where it is desired to take out water. To install an orchard valve, chisel a hole about $3\frac{1}{2}$ inches in diameter into the supply line at the point where the water is required (Fig. 7). Attach over this opening, by means of cement mortar, a 12-inch length of six-inch pipe, known as a riser, in a vertical position and place a six-inch orchard valve on top of the pipe and secure this with cement mortar.

When the furrow system of irrigation is to be used, a distributing stand-pipe with a number of openings, equal to the number of furrows to be irrigated, is fitted over the riser and valve. The distributing stands are placed over the risers and aligned and adjusted, the gap between the riser and distributing stand being filled with cement or concrete.

The openings in the sides of the distributing stand-pipe may be provided with small galvanized iron sliding gates, by means of which the flow of water through each opening may be regulated.

The openings in the distributing stands should be at ground level to prevent scouring.

During irrigation operations all the under-arch valves above the pressure gates from where the irrigation is to commence should first be opened in order to allow the air to escape. Failure to do this may cause cracks in the pipe-line, usually at the joints, as a result of "water hammer". Once the pipe-line is filled with water, the flow at the stand-pipes is regulated by means of the under-arch valves.

The Size of Pipes to Use.

The diameter of the pipe line to be used is determined by the volume of water required on the land or in the orchard, on the size of the area to be served by a single pipe-line, and on the slope to the distributing centre.

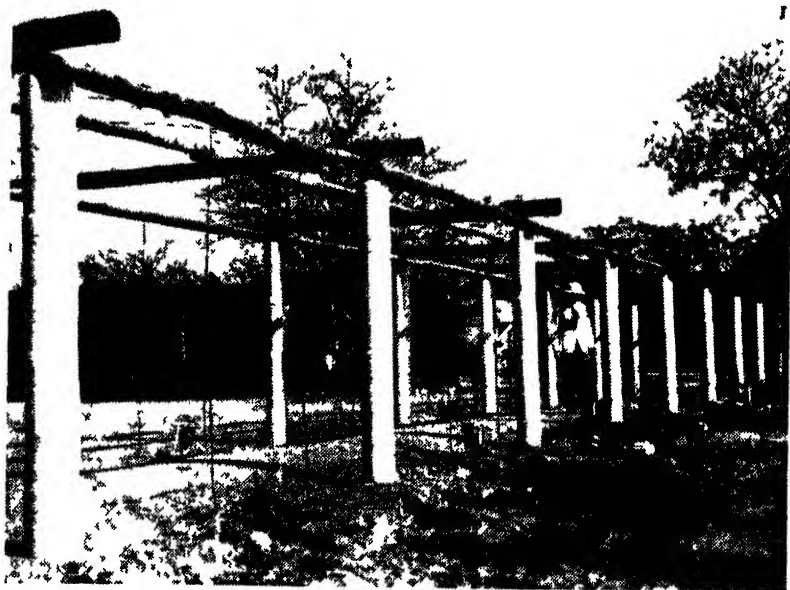


FIG. 8.—A pergola constructed of concrete pipes.

Where it is intended to irrigate simultaneously from a number of lateral lines taken from the main line, the diameter of the main line should be large enough to carry the required volume to all the laterals at the same time.

Cost of Mould and Accessories and Fittings.

Apart from the cost of making and laying the pipes, the cost of the pipe mould and necessary accessories and pipe-line fittings, such as gates, frames and under-arch valves, have to be considered.

In normal times the cost of a complete pipe-making outfit, including a number of foot rings for shaping the tongue and groove-ends of the pipes, should not exceed £40 for each size of pipe to be made.

Some Properties of New Insecticides.

B. K. Petty, Insecticide Entomologist, Division of Entomology,
Pretoria.

THE public interest aroused by such new insecticides as D.D.T. and benzene hexachloride has brought with it certain problems and responsibilities. With the discovery of these new weapons the public appears to have become much more insect-conscious than ever before, but over-enthusiasm and the indiscriminate use of these insecticides may prove a danger unless certain underlying principles associated with pest control and certain limitations of the insecticides are understood. The discovery of D.D.T. and benzene hexachloride is only a beginning on the road to the discovery of many other new organic insecticides. Reports of further discoveries have already appeared in the press together with extravagant claims as regards their effectiveness against many insect pests. Used correctly, the press is a most valuable organ for the dissemination of information but great care should be observed in supplying the public with scientific information. Extravagant statements made by insecticide manufacturers and salesmen may be of great news value, but are decidedly not in the public interest. The object of press publicity in scientific work should be to make available to the public an honest picture of results obtained through sound research work. If only part of the story is told, it will lead to confusion and will result in lack of confidence not only in the press but also in the source from which the information is derived. In this connection, D.D.T. has probably received more press publicity all over the world than any other insecticide. Unfortunately some of the information has been misleading. To some extent it has been used for its news value rather than to give a correct picture of its uses and capabilities. This, in many cases, has led to a completely wrong conception of its value and dangers.

In this article an attempt will be made to give, as far as possible, an accurate picture of some of the properties of certain of the new insecticides, based on research work carried out by workers in different parts of the world. A great deal more work is needed, however, before finality can be reached on many points.

Chlorinated Hydrocarbon Insecticides.

D.D.T. (Dichloro-diphenyl-trichloroethane).—D.D.T. has been much publicized and has come to occupy an outstanding position in the field of insecticides. Further investigations are necessary, however, in order to obtain a working knowledge of its potential usefulness and possible hazards, particularly in respect of its use against insects attacking crops. Many questions relative to the best formulations to use, the dosages to apply, application schedules, residue hazards and effect on beneficial insects, plants and soils, have yet to be answered more fully before exact recommendations can, in many cases, be made. The following facts about D.D.T. may therefore serve as a guide to those wishing to use this insecticide against agricultural pests.

(a) D.D.T. will not kill all the important pests, although, with the possible exception of benzene hexachloride, it is probably toxic to a wider range of insects than any other insecticide. Against some insects it is no better than the chemicals ordinarily used, while against others it has shown little, if any, effect. Tests up to the

present have shown that, whereas the performance of D.D.T. as an insecticide is outstanding against certain pests, it is definitely not a "cure-all" for all insect problems.

(b) Owing to the persistent nature of D.D.T. residues the normal washing and cleaning processes to which fruit and vegetables are subjected do not entirely remove the D.D.T. deposit. Hence, if it is applied to fruit or the edible portions of vegetables, this should be done in the early part of the season and not just before harvesting. The treatment of such crops as potatoes, sweet potatoes, onions, etc., involves few or no hazards as the edible portions of the plant are produced below the ground and the treated portion is not used. In the case of some cereal crops, the grain has a protective covering and there is little likelihood that the seeds will be dangerously contaminated. From the residual aspect there seems no reason why D.D.T. should not be used on shade trees and ornamental plants. The treatment of crops such as fodder plants and lucerne involves a more serious hazard, although from information gradually accumulating it would appear that the use of D.D.T. on these crops is not as dangerous as was at first supposed. Experiments indicate that, if this compound is used at correct insecticidal strength, there should be very little danger of serious consequences. If the plants are treated shortly after they appear above the surface of the ground, the danger of residual effect should be negligible. It is of interest to note, however, that published reports indicate that if D.D.T. intake is greater than 7 parts per million in animal food, appreciable storage of the material in the fat can occur. While animals are feeding freely, several times the acutely fatal dose may be stored and subsequently this stored D.D.T. may be mobilized if the animals are starved. Signs of poisoning can then develop in such animals.

(c) D.D.T. can induce poisoning and even death in man and animals if abused. This, however, is by no means peculiar to D.D.T. as many other insecticides in general use to-day are definitely more dangerous in this respect. There appears to be a wide margin of safety in its use as an insecticide. With the low concentrations recommended for the control of agricultural pests, there is no reason to expect any undue danger to man and animals. There is also no danger of absorbing either dry powders or water suspensions through the skin, but care should be exercised in handling oily solutions, especially if in concentrated form. Contaminated skin areas should be washed at once with soap and warm water. Inhalation of sprays and dusts should be avoided as much as possible, although there appears to be little serious hazard in this.

(d) There is some question about the safety of heavy applications or D.D.T. to the soil at one time or over a period of several years. The actual effect, however, can only be determined over a long period of time. The type of soil involved appears to be an important factor. Work done in America has included the addition of D.D.T. to clay loam, sandy loam, fine sand and acid muck soil. On the lighter soils, 25 lb. per acre of technical D.D.T. depressed or retarded the growth of some vegetables such as cucumbers, squash, beet, spinach, tomato and beans. On muck acid soils 25 lb. per acre had only a slight effect on the growth of these crops if planted immediately, and no effect if planted two months after mixing the D.D.T. in the soil. The application of 25 lb. of technical D.D.T. per acre to the lighter soils had no effect on maize, turnips, cabbage and radish. It is interesting to note that in the case of muck soils the addition of lime to the D.D.T.-treated soil resulted in depressed growth of some of the vegetable crops. Three months after the incorporation of the D.D.T.

in the acid muck soils there was no toxicity to plants from levels of D.D.T. as high as 1,000 lb. per acre. On the muck soils to which lime had been added, the D.D.T. toxicity to plants grown in the soil remained constant. There is some indication that certain decomposition products of D.D.T., such as sulphone, are injurious to plants. Similarly, a more highly purified para para D.D.T. was less toxic than some of the technical formulations.

(e) As far as our knowledge goes, D.D.T. seems to have an adverse effect on only a few plants. The most important of these are the cucurbits, of which many seem to be adversely affected.

(f) Experiments with D.D.T. on certain microbiological processes in the soil have thus far indicated that, in tests where D.D.T. was applied much in excess of the quantity which would ever be applied for the control of insects, no injury to micro-organisms will result. Ammonification, the accumulation of nitrate, and the normal concentration of salts in the soil have not been seriously modified.

(g) Oil solutions should not be used on crops. It is important to remember that nearly all organic solvents in conjunction with D.D.T. may lead to foliage injury, unless the quantities of solvent are very small. Even emulsions should not be used at concentrations stronger than those recommended. Dusts and water suspensions are the safest D.D.T. formulations.

Dichloro-diphenyl-dichloroethane.—This is a compound related to D.D.T. and is known as Rhothane or D.D.D. It differs from D.D.T. in that two instead of three chlorine atoms are attached to the second carbon atom of the ethane group. It may be slightly more stable under conditions of high temperature and light, and may give slightly more residual action in the field. The technical material is primarily the para para isomer. The purified isomer melts at 109° to 110° C.

It is recommended for the same uses as D.D.T. at comparable dosages, being slightly more toxic than D.D.T. to some insect species and slightly less toxic to others. It is said to have a low order of toxicity to warm-blooded animals, but the same precautions should be observed as with D.D.T. formulations in its use as an insecticide.

Technical dichloro-diphenyl-dichloroethane is now being produced as a dust concentrate, a wettable powder, a solvent concentrate and an emulsion.

The methoxy analog of D.D.T. [*Di (p-methoxyphenyl) trichloroethane*].—This compound appears to be, in general, a less effective insecticide than D.D.T. or D.D.D. against most insects and has not the same residual effect.

Benzene hexachloride ($C_6H_6Cl_6$).—At least five patents have been issued covering methods of production, but no patent has been issued with regard to its use as an insecticide. It is an amorphous solid consisting of five main isomers. The approximate proportions of these isomers in the crude chemical are: alpha 70 per cent.; gamma 10-12 per cent.; and the remainder which consists of beta, delta and epsilon isomers and impurities. The insecticidal properties were discovered in France in 1941 and independently in England in 1942 where the principal action was ascribed to the gamma isomer and its use against agricultural pests was developed. In general, it is considered for the same uses as D.D.T., but it is also effective against certain insects poorly controlled by D.D.T. and has a more rapid "knock-down" action. Its residual effect is, however, inferior to that of D.D.T.

Since benzene hexachloride is exceptionally stable at high temperatures, it can be applied as a smoke aerosol by volatilization from hot plates or by other heating methods, and also as dusts, solutions, emulsions or water suspensions.

On account of the danger of imparting its unpleasant odour to food-plants, it should not be used in soils where root crops are soon to be planted. Taste contamination of fruits and some vegetables has also been attributable to applications of benzene hexachloride. Odour-free miscible oils and solutions containing benzene hexachloride are now being produced, however, and it is probable that in the course of time the objectionable odour will be eliminated from all formulations.

The effect of benzene hexachloride on soils has not been fully determined. At the present time substantial data are not available on its permanence and stability under all soil and climatic conditions. Soil type and character appear to be important factors in determining the toxicity of this product. The data obtained as a result of soil residue experiments indicate that it should be used with caution and that concentrations should be kept at a minimum until a better understanding of the permanent effects is obtained. It is reported to be toxic to cucumbers, squash, beet, spinach, tomatoes, turnips and cabbage even at fairly low levels in the soil. An application of 2.5 lb. per acre of gamma isomer in the top three inches of soil did not appear to injure cat, rice and cowpea seeds and seedlings, but germination and growth was stopped by dosages of 5 lb. or more per acre. Field crops and ornamentals were apparently not adversely affected by one application of 4 ounces of gamma isomer per acre. In small field trials, a soil application of 100 lb. benzene hexachloride (30 lb. of the gamma isomer) per acre greatly reduced germination and early development of peanuts, mealies, cotton and soya beans, while 200 lb. of D.D.T. per acre caused no obviously reduced germination or damage to the early development of these crops.

No phytotoxic effect has been observed when benzene hexachloride is applied to fruit foliage at concentrations necessary to obtain satisfactory pest control on apples, peaches and plums. It has not been used extensively enough to reach any final conclusions as to its effect on plants in general, but it appears relatively safe to assume that only comparatively few will be adversely affected.

Work in progress suggests that, from a chronic or cumulative standpoint, benzene hexachloride is less toxic than D.D.T. to man and animals, or at least not more so. It has been reported, however, that when used as a dust in field applications, it has caused headache and irritation of the skin and eyes of some people exposed to it.

Published reports indicate that the gamma isomer may be absorbed through the skin, particularly from solutions. Reactions have been noted with rabbits at levels of 20 mg. of gamma benzene hexachloride per kilogram of body weight after two or more applications.

Chlordane ($C_{10}H_6Cl_8$).—This new chlorinated hydrocarbon insecticide which is sometimes known as Octa-Klor or Velsicol 1068, is a viscous, colourless, odourless liquid. It is readily soluble in all proportions in most organic solvents such as aromatic, aliphatic and chlorinated hydrocarbons, ketones, ethers, esters and alcohols, but is insoluble in water. It is completely miscible in deodorized kerosene commonly used in insecticide formulations. Like D.D.T., chlordane in the presence of weak alkali forms a product which

apparently is non-toxic to insects and for this reason it should be considered incompatible with materials having an alkaline reaction. It has low volatility, being intermediate between D.D.T. and benzene hexachloride. It appears to have a longer residual effect than benzene hexachloride but in general is inferior to D.D.T. in this respect.

Chlordane may be formulated for insecticidal use as an oil solution, an emulsion, a wettable powder or a dust. A space spray containing 0.2 per cent. chlordane is recommended for flying insects, together with a "knock-down" agent such as pyrethrum, lethane or Thanite if quick effect is desired. As a space spray it is slightly more effective than D.D.T. against house-flies but less effective against mosquitoes. As a residual spray for crawling insects a 2 per cent. concentration is recommended. In dust form against agricultural pests a concentration of 1 to 2 lb. of chlordane per acre is suggested.

It is said to be more effective than D.D.T. against certain insects such as cockroaches, grasshoppers, aphids, ants and certain species of ticks.

As with D.D.T. and benzene hexachloride, its effect on soils and plants has not been fully determined. Hence it should be used with caution and at minimum concentrations until fuller information is available. It appears to be no more toxic to man and animals than D.D.T.

Toxaphene.—Toxaphene was formerly known as 3956 and is a chlorinated terpene hydrocarbon with the formula $C_{10}H_{16}Cl_8$. It is a cream-coloured waxy solid with a mild piney odour. It melts at the range of 65° to 90° C., is readily soluble in common organic solvents, and can be formulated in oil-soluble concentrates, water suspensions and dusts. In solid form it may be stored for at least a year without deterioration. Solutions can be stored in suitable containers for an equal period of time. It is similar to D.D.T. in methods of use and effectiveness against common household insects but somewhat slower in producing paralysis. It has residual action and is a promising contact and stomach poison in sprays and dusts against a number of agricultural pests. It is compatible with sulphurs, Bordeaux mixtures, lead arsenate, calcium arsenate, summer oils and nicotine sulphate. Strongly alkaline materials should, however, be avoided in toxaphene formulations. It is less effective than D.D.T. as a space spray, and is also inferior as a residual spray against house-flies, mosquitoes and cockroaches.

As regards phytotoxicity, no adverse effects have been noted on beans, apples, grapes and peaches or on any other plants, except cucurbits and potatoes, where the damage may be serious. It appears to have practically no fungicidal properties.

Toxicity to warm-blooded animals has not been fully established and until complete information is available, it should be treated as toxic. It is believed, however, that it will show toxicity on percutaneous application when in the form of a solution.

It appears well established that the chlorinated hydrocarbon insecticides such as D.D.T., benzene hexachloride, chlordane and toxaphene are stable, are resistant to soil micro-organisms and that they are insoluble and do not leach appreciably. Additional studies are needed to determine what effect the continued use of these materials in sprays and dusts may have on plants and soils. If, after continued applications of these chlorinated hydrocarbons to

plant foliage for insect control, a residue should inhibit growth, the injurious effects may become permanent and difficult to remove. Depressed or retarded growth may occur without causing any very obvious symptoms. These points should be borne in mind in all experiments with these insecticides.

Another of the limitations of certain of the chlorinated hydrocarbon insecticides is that they are toxic to many beneficial insects which materially assist in keeping in check many harmful pests. Experience has shown that caution must be exercised in this regard, otherwise a treatment may do more harm than good, and outbreaks of insects that are not normally pests, because they are controlled by parasites and predators, might well occur. Red mites, white fly and woolly aphid have been observed to increase following treatment.

Miscellaneous Insecticides.

Hexaethyl tetraphosphate.—This compound has the chemical formula $C_{12}H_{30}O_{13}P_4$ and is commonly known as Hetp. It is a yellowish liquid, miscible with water and many organic solvents, but not with kerosene or petroleum spray-oils. The pure compound is stable but hygroscopic, and hydrolyzes within a few hours. Products containing hexaethyl tetraphosphate are now in production for liquid spraying and dusting. Dusts and sprays are reported to be effective for the control of red spider, aphids, immature scales, thrips, leafhoppers and mealy bugs, and the compound appears to be useful for a number of purposes for which nicotine is used. Its ovicidal effect on mite eggs is poor.

The spray formulation is generally a 50 per cent. liquid concentrate for use at a 1 to 800 water dilution. Sprays should be used promptly after mixing, and dusts should be applied within 10 days of manufacture, depending on the advice of the manufacturer. The price of this product is in the general range of nicotine.

The material is effective at cool temperatures as well as fairly high ones. Since the chemical decomposes rapidly, residues probably will not present a serious health hazard. The compound is irritating to the skin, and contact with it should be avoided as much as possible.

Injury has been reported on cyclamen and tomatoes in greenhouses but to no other plants. It is not compatible with alkaline materials and should not be applied over fresh residues of Bordeaux mixture.

Tetraethyl pyrophosphate.—Tetraethyl pyrophosphate is commonly known as Tep and was discovered through an extensive series of studies of phosphorus compounds. It is said to be effective against insects not affected by D.D.T. In laboratory tests it is reported to have given good results against aphids, being ten times as toxic as nicotine alkaloid. In general it is three times as toxic to insects as hexaethyl tetraphosphate. This compound does not leave a poisonous residue, but decomposes a few days after application.

Di (4-chlorophenoxy) methane.—Di (4-chlorophenoxy) methane is commonly known as K.1875 and has the empirical formula $C_{13}H_{10}O_2Cl_2$. It is not yet registered for sale and is obtainable only in small quantities for experimental purposes. Commercial production is, however, planned for 1948.

This compound is a solid, chemically stable and slightly soluble in water, and appears to have no fumigant action. Four per cent. is soluble in kerosene with heat, but it stays in solution upon cooling. It is much more soluble in other organic solvents.

It can be used as a water suspension, dissolved in oil or other organic solvents, or in dust formulations. One pound per 100 gallons water and 4 per cent dusts are reported to have been effective against red spiders and mites. At 2 to 3 lb. per 100 gallons it killed mite eggs. It is claimed to be effective for 60 days in the laboratory and for nearly half as long in the field. No data are available on toxicity to human beings, but the subject is being investigated.

Sabadilla.—Sabadilla is an old contact insecticidal material which has taken on a new lease of life, largely on account of the war need for more and better insect-killing agents. Sabadilla insecticide is made from the seeds of a lileaceous plant, *Schoenocaulon officinale*. The alkaloid occurring in Sabadilla about which most is known is Cevadin, and it is described as being intensely poisonous. This insecticide has been used to a considerable extent against vermin of the human body, as well as against ticks and lice on domestic animals. The latest review of Sabadilla insecticide states that it appears likely that its use will be increased, although it is doubtful whether it will assume a large place in the insecticide field. The irritating effect of the dusts and sprays on the operator and the fact that little is known about the toxicity of the material other than that it is highly poisonous to higher animals, are limitations to its use. It is reported to give good results against stink-bugs and other plants bugs.

Azobenzene.—This synthetic organic compound has been known for a great number of years, but it has only recently been tested as an insecticide and acaricide. Azobenzene is selective in action and several species of insects have proved highly resistant to it. It has been found to have little or no effect on certain species of aphids, whereas very promising results have been obtained against red spider mites where it has also exhibited good ovicidal properties.

In America, azobenzene has given good control of the Colorado potato beetle, Mexican bean beetle and certain caterpillar pests such as the European corn borer and the eastern tent caterpillar.

Sprays have caused some damage to the foliage of certain varieties of apples, but no damage has been observed to tomato, cucumber, bean, grape or carnation plants with either dusts or sprays.

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Concrete-Pipe Making and Laying for Irrigation:—

[Continued from page 888.]

The number of pipes which could be made with such an outfit will depend on the treatment which the different parts receive.

With reasonable care it should be possible to make 12,000 to 15,000 pipes before replacing any part. The core part of the mould will probably be the first item for replacement, as it wears more rapidly in the middle than at the ends and in time may become so worn that it is impossible to extract it from the pipe. Spare cores cost approximately £8. The cost of the fittings may vary considerably. These may be obtained from local irrigation-equipment manufacturers, or from agents representing overseas engineering firms.

Gates cost from £2 to £3 each, depending on the size. Similarly, gate-frames cost from 8s. 6d. to 12s. 6d. each, and under-arch valves from 5s. 6d. to 8s. each.

Other Uses for Concrete Pipes.

Concrete pipes may also be put to other uses. An excellent flower-pot can be made of a distributing stand-pipe ten or twelve inches in diameter. For taking storm water from buildings, six-inch pipes could be laid just below the surface, with the down-pipes discharging into them. The larger sizes may even be used as culverts under paths or roads.

Six-inch or eight-inch pipes are ideal for the construction of pillars for pergolas (Fig. 8). To commence the structure, concrete the first pipe of each column into the ground one foot deep on a concrete foundation. Fill the pipe to within four inches from the top with soil and tamp in. Place the next pipe on top of the first one and fill with cement to eighteen inches from the top of the pipe to form a collar at the pipe joint. For reinforcement, a length of iron rod or a fencing standard may be used.

Allow to set and continue adding the columns in the same way, until the required height is reached. Fig. 8 shows a pergola built of six-inch pipes with gum poles fitted over the top and held in position by bolts cemented into the tops of the pipe pillars.

Concrete pipes may also be used in the construction of tennis-court shelters, summer houses, garden arches and verandah poles. If columns built from pipes as described are rough-cast, the joints are hidden and the pillars will resemble solid columns.

Mottle-Leaf Disease of the Sweet Potato.

A. P. D. McClean and P. J. Klesser, Division of Botany and Plant Pathology.

DURING 1946 a disease of the sweet potato, hitherto unrecorded in South Africa, was observed at Nelspruit, eastern Transvaal. A preliminary survey in other parts of the Transvaal revealed a similar disorder in the districts of Pretoria, Brits and Rustenburg. The disease is probably the same as one reported for the first time in 1944⁽²⁾ from East Africa where it is said to be widespread in Uganda, Tanganyika and the Belgian Congo and to be of serious importance in those parts dependent on the sweet potato as a major source of food. A disease with similar symptoms is also reported from the U.S.A.⁽¹⁾.



Fig. 1—Experimentally infected plant on left and healthy plant on right.

Our studies are not sufficiently advanced for us to give a comprehensive picture of the effects of the disease over the range of varieties grown in South Africa. This preliminary account is intended primarily to draw the attention of the grower to the existence of the disease and to offer him tentative suggestions for checking its spread.

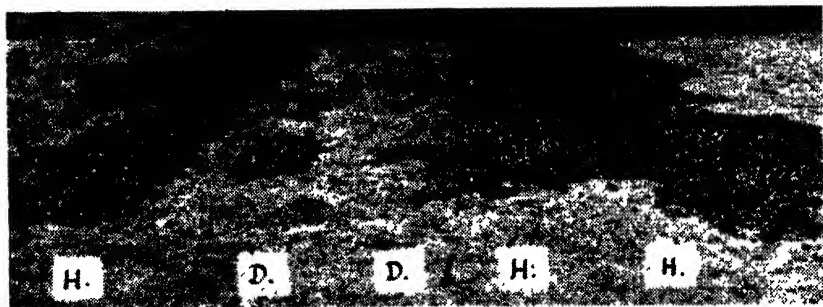


Fig. 2—Plants established from healthy cuttings in rows marked H, and from diseased cuttings in rows marked D.

Although the disease does not kill affected plants, it has a very adverse effect on the growth of the plant by stunting the vines. No information is available yet on the actual effects on the yield of "tubers", but it is reasonable to expect that in some varieties the development of "tubers" will be appreciably reduced, judged by the severe stunting of the aerial growth. The stunting of the vines is illustrated in the accompanying photographs. Figure 1 shows an experimentally infected plant on the left and a healthy plant of the same age on the right, the growth of the latter being nearly three times that of the diseased plant. Figure 2 illustrates the comparative growth of diseased and healthy plants of the same variety after 4 months. The plants were grown from cuttings, which were planted in the open in five rows, three of them (marked "H") with healthy material and two (marked "D") with diseased material. About half of the diseased cuttings died without rooting, and the remainder, as can be seen in the photograph, made poor growth in comparison with the healthy plants.



Fig. 3—Leaves with typical mottle symptoms from naturally infected plant found at Brits.

Symptoms of the Disease

Stunted growth, however, may be due to other reasons, such as poor soil and insufficient water, and therefore in itself is not a sufficiently reliable character for diagnosis. The most reliable symptom for recognizing the disease is an abnormal mottling of the

MOTTLE-LEAF DISEASE OF THE SWEET POTATO.

leaves, and for this reason we have used the name "mottle leaf". We have found this symptom to be consistently associated with both naturally infected plants and those we have managed to infect artificially. The type of mottling may vary with different varieties, but the more characteristic form is that produced by a yellowing that tends to follow the course of the veins and to produce as it were a yellow network on the leaf. Examples of the effect are illustrated in figures 3 and 4. This symptom is perhaps best defined on the



Fig. 4—Leaves with typical mottle symptoms from naturally infected plant found at Nelspruit.

younger leaves that have just reached maturity and is never evident on young immature leaves. Mottle symptoms, however, are not always so well defined as those in the illustrations, and sometimes are comparatively faint and diffuse, particularly if plants are growing under conditions that do not favour rapid growth. We have also sometimes observed a mosaic mottling of the type illustrated in figure 5; this is characterized by an irregular intermingling of dark and light green areas without any yellowing along the path of the veins. We do not know whether this condition is due to the same disease.

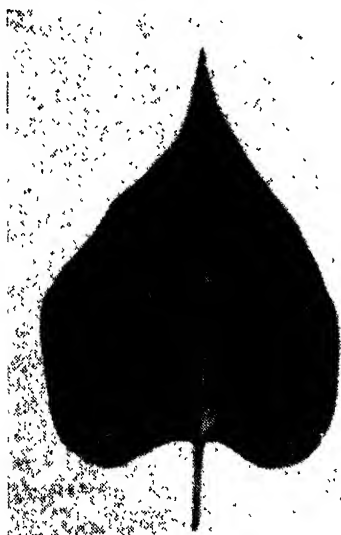


Fig. 5—Leaf with a "mosaic" mottle from naturally infected plant found in Rustenburg district. [Photos by H. King.]

Affected plants may, in addition to the mottling symptoms, be generally pale in colour, with their leaves reduced in size and more closely grouped on the stems. There is little if any distortion of the leaves.

In a field of sweet potatoes the identity of the individual plant is lost in the mass of tangled vines that spread over and cover the ground, and diseased plants, unless specially looked for, may easily escape notice in the composite cover. The more vigorous growth of healthy plants will tend in any case to overgrow and fill up any gaps that might occur from the poorer growth of diseased plants. It should also be pointed out

that the mottling symptoms are not usually conspicuous in the field and it may be necessary to inspect the plants closely before distinguishing them.

The disease has proved to be transmissible from diseased to healthy plants; this was successfully achieved by grafting small diseased shoots on to healthy plants, which then developed the same mottling symptoms as are associated with naturally infected plants. On the other hand, no transmission occurred when the leaves of the healthy plants were rubbed with the sap expressed from diseased plants.

Cause of Disease and Mode of Transmission.

No visible organism has been found in association with diseased plants, and there is little doubt that "mottle leaf" is a disease of the virus type. One of the characteristics of virus disease is that the infective principle, which is invisible, invades the whole plant with the usual exception of the true seed. It follows therefore that diseases of this type are perpetuated in any plants that are propagated vegetatively from an infected parent, whether by cuttings, tubers, or other vegetative means. The propagation of the sweet potato as a field crop is done exclusively from stem and root cuttings and therein lies one way in which this disease can be multiplied in the field. The grower himself can take precautions to avoid this by selecting his cuttings from healthy plants. But this does not explain how the disease spreads to healthy plants. We have no information yet on either the method by which the disease spreads in this way in the field or the rate at which it spreads. It is reasonable to expect that some species of insect will prove to be the vital link in the chain as most viruses depend on insects for their spread from diseased to healthy plants.

Control.

For the present, growers are advised to inspect their plants closely for signs of "mottle leaf" and to select, as far as it is possible, healthy stock for planting. How effective this method will prove, depends largely on the rate of secondary spread. Control may ultimately depend on finding immune varieties.

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Notice to Pigeon Breeders.

As an entirely new method has now been developed for the preparation of chicken-pox vaccine, pigeons are no longer required for this purpose. Consequently, all farmers and breeders of pigeons who from time to time so readily responded to appeals for live pigeons are hereby notified that no further birds are required either at the Allerton Research Laboratory, Pietermaritzburg, or at the Veterinary Research Laboratory, Onderstepoort.

The Department would like to avail itself of this opportunity to thank all those who in the past co-operated by responding to urgent appeals for pigeons.

The Destruction of Harmful Birds:—

[Continued from page 848.]

There are various forms of traps such as the nest-box trap, sieve trap, bait box trap and funnel trap. One great advantage of these traps is that the beneficial birds caught can be released unharmed.

Where finches are destroying grain crops the following method of destroying them has been used with success. A long piece of high-strain, steel fencing wire is stretched very tightly across the field about a foot above the heads of the ripening wheat. The wire is about 50 yards long and is carried on two heavy poles set in the ground, one at each side of the field. At one side, near the pole on the ground sits a native who pulls the wire down with a short piece of leather strap. When birds come over the land, many of them sit on the wire which is then suddenly released like a bow-string and hits upwards to kill the birds sitting on it. In this way many of the birds are killed and the others driven away. At frequent intervals all the dead birds should be collected and any that are injured and not quite dead should be killed.

In the case of kaffircorn, some varieties are said to be "bird resistant" and a certain amount of this is grown in South Africa, but just how resistant this variety is, is not known.

Poisons.

Under certain circumstances great numbers of birds can be destroyed with poison baits, but whether field crops have ever been entirely saved from damage by this method is an open question.

In using baits for the control of pests the bait is usually in competition with the natural food supply and in the case of birds, if they have plenty of grain to feed on, they may not take poisoned grain put out as a bait. Much depends on circumstances. It may be possible to drive the birds out of a land and so cause them to feed on bait in a bare piece of land or on a road nearby. Many birds seem to be resistant to arsenic and the best poison to use is usually strychnine because this is a very quick-acting poison. There are three forms commonly available, the insoluble crystalline form called strychnine alkaloid, and the two soluble forms, strychnine sulphate and strychnine hydrochloride. The alkaloid is said to be most effective but it must be ground into a fine powder before use.

Coated grain bait is quicker in action than soaked grain bait because the poison is digested sooner and the dried bait has the great advantage that it can be kept indefinitely and then used at once as required.

Mix one ounce of finely powdered strychnine alkaloid with one and a half pounds of wheat flour and add cold water, while stirring, to make a smooth paste without lumps. Then stir in enough boiling water to make about half a gallon of mixture. The boiling water does all the cooking that is required.

Put 50 lb. of wheat, kaffircorn or millet seed into a large box or on a hard floor and pour the poison paste over this while turning over the grain and mixing it thoroughly with a spade. Every seed should have a coating of the paste on it. Then spread out the bait on a sheet of canvas in a thin layer to dry. It will dry quite well

in a mass six inches thick if it is turned over a few times. If the seeds stick together in lumps to some extent, these lumps can easily be broken up by hitting them with the back of the spade.

If the soluble strychnine sulphate or hydrochloride is used, the bait should be made as follows: Mix $1\frac{1}{2}$ lb. of wheat flour and a little cold water into a smooth paste. Dissolve one ounce of the poison in one quart of boiling water and stir this into the paste while hot. Add enough boiling water to make up the mixture to about half a gallon of thin paste and pour this over 50 lb. of seed. Mix and dry as described above.

The soaked grain bait mentioned above is made with the soluble poison dissolved in hot water as follows: Dissolve a quarter of an ounce of strychnine sulphate or hydrochloride in about one quart of boiling water and pour this over 10 lb. of crushed grain in a china basin. Add enough hot water so that the liquid just covers the grain, stir and allow to stand overnight. In the morning the soaked grain is ready for use, but it cannot be kept for any length of time as it will ferment. Fermentation may be delayed for a few hours by the addition of a teaspoonful of borax to the liquid.

One pound of poison grain bait is enough to kill about 100 finches. In baiting it is sometimes advisable to feed untreated grain to the birds on an open piece of land for a few days before putting down the poisoned bait. This is done to get them used to feeding on the baited area.

Remember that strychnine is a deadly poison to humans and to all domestic animals and must be used with proper care. Wash the hands after handling the poison or the bait and carefully wash all utensils used in its preparation.

Keep the poisoned grain in an air-tight tin or drum which should be properly labelled and kept in a locked store so that no irresponsible person has access to it.

Crows.

It is not easy to poison crows either with arsenic or any other poison. In an old report of the Ohio Agricultural Experiment Station the following methods, which are considered very sound, are recommended for use in mealie lands:—

1. Shooting, and then hanging a few dead birds in the lands. This is said to keep the crows away for several weeks.
2. The use of scarecrows made of old barrels which are changed in position at frequent intervals.
3. Stretching a string round and across the lands on upright poles with pieces of rag and bits of bright tin hung on the string.
4. Deep planting of seed—up to four inches in depth.
5. The use of steel traps suitably baited and set in the lands.
6. Tarring of the seed. This is said to be very effective and the procedure is given as follows: Put a bucketful of mealies in a half-barrel tub and pour over this as much hot water as will just cover the seed. Dip a thick stick into gas tar and stir this briskly into the mealies, repeat until the mealies are all black and evenly coated with the tar. The hot water melts the tar just enough to make this

The Farm Home.

(A section devoted mainly to the interests Farm Women.)

Smocking.

(Compiled by Miss Joyce de Jong, Home Economics Officer,
Department of Agriculture.)

SMOCKING is a charming form of embroidery on children's frocks, blouses, underwear and nightwear. It is most effective when done in various shades of one colour, although very attractive designs may be embroidered in contrasting colours.

Materials.

Materials used for smocking should not be too thick and should not crease easily. Crêpe de chine, georgette, voile, muslin, flannel and uncrushable linen are all suitable. Embroidery cotton and floselle are generally used for the design, and silk and cotton for the gathers. A silk thread must be used for gathering very thin material, since cotton will leave marks.

Preparation.

The preparation of the material is extremely important since the appearance of the finished article depends entirely upon the evenness of the gathers. Allow three times as much material as the desired width of the smocking. Place a smocking transfer on the wrong side of the material and, using a hot iron, press the desired number of rows of dots onto the wrong side of the material. In the case of very thin material the dots must be ironed on very lightly so that they do not show through on the right side. Materials with regular spots or checks may be gathered simply by following the checks or spots. Always work in the direction of the grain of the material except in the case of round yokes.

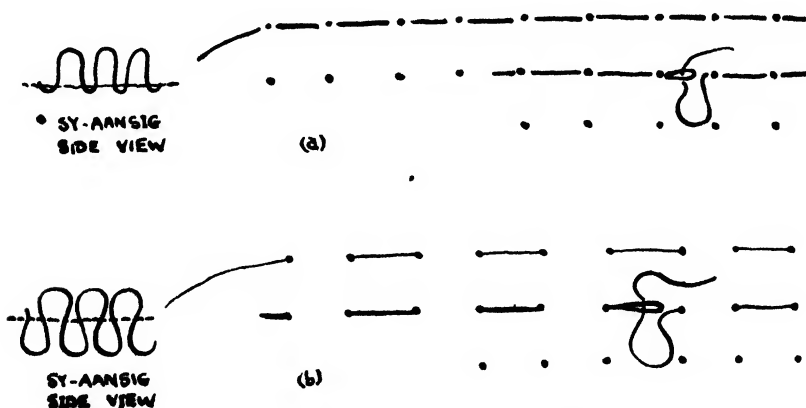


FIG. I (a).—Side view of shallow pleats.

FIG. I (b).—Side view of deep pleats.

Gathering.

Begin with a knot and secure the thread by taking a back stitch. Lift each dot with the needle, proceeding thus to the end of the row. Let the thread at the end of the row hang loose. Gather all the rows in exactly the same manner. In this way shallow pleats are formed. [Figure 1 (a)].

Another method is to insert the needle through one dot and bring it out through the next all along the line. Deep pleats are formed. This method is desirable on thin materials such as georgette. [Fig. 1(b)].

When all the rows have been gathered, the material is drawn up and each two threads tied together. Stroke the gathers carefully to even up the pleats. The gathering threads serve as a guide for the straight rows of smocking. As a rule, the design is worked *on* the gathering stitches, with the following two exceptions:—

- (1) When working the double cable (see further on).
- (2) When making Vandyke points where one stitch is made between two rows of gathering threads (see further on).

Figure II shows how the dots are ironed from the transfer for a round yoke or neckline. The paper is cut neatly between the dots and then spread open so that the lower portion is sufficiently wide to cover the area. In order to ensure that the hem of a smocked child's frock or any other such article with a round yoke lies on the grain

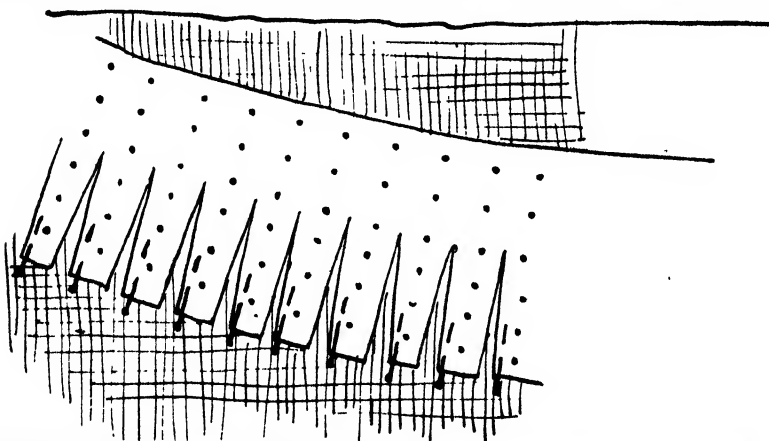


FIG. II.—How the dots on the transfer must be ironed off for a round yoke or neckline.

of the material, the length from the shoulder to the hem, and from the front of the neck to the hem, must be measured. Use the desired width of material and draw a curved line at the top for the neckline. The top row of dots on the transfer is now put on this line.

Working the Design.

Let the right side of the material face you. In smocking, the needle must be inserted absolutely straight, otherwise the work will look untidy, and an even tension must be maintained. With a few exceptions, smocking is worked from left to right.

The Various Stitches.

(1) Outline or Rope Stitch.

It is advisable to start the smocking with one or two rows of straight stitches to keep the work in position. Outline stitch is often

SMOCKING.

used for this purpose, in the same manner as in ordinary embroidery work, except that a pleat is caught with each stitch.

Commence by making a knot in the thread. This knot is necessary and permissible in smocking. Bring the needle out to the left of the first pleat, make a stitch over the pleat to secure the thread and take up the tip of the pleat to the right, in line with the grain of the material, keeping the needle absolutely straight. Proceed in this manner to the end of the row, taking up the tip of each pleat. Keep the row absolutely straight and always see that the thread is above or below the needle (Figure III). If desired, work a second row.

(2) Cable Stitch.

This is done in exactly the same way as outline stitch except that the thread is reversed with each stitch, on alternate pleats. This stitch is often used as an alternative for outline stitch at the beginning of a design. (Figure III).

(3) Double Cable Stitch.

This is worked in the same way as (2). Commence in the same stitch and work two rows next to each other. In this manner a chain will be formed. (Figure III).

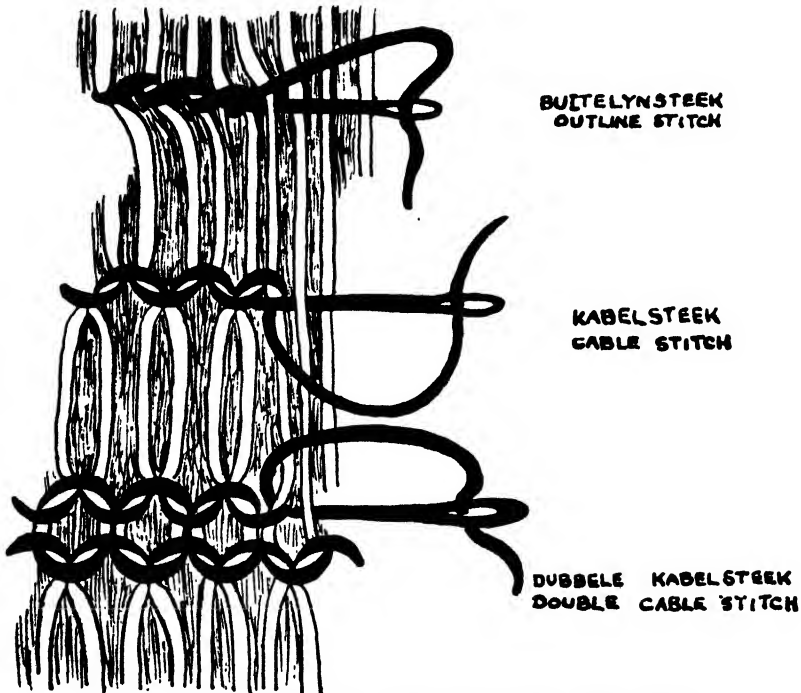


FIG. III.—Outline stitch, cable stitch and double cable stitch.

(4) Outline Stitch Worked in Vandyke Points.

Outline stitch worked in points is popular in smocking. Instead of keeping in a straight line, each stitch is worked slightly higher than the previous one until the highest point is reached on the previous row of gathers, or perhaps even the one above that. Then each stitch is worked a little lower than the previous one until the original starting row is reached. More than one row may be worked in the same direction or the points may be swung round to form diamonds (Figure IV).

(5) Honeycomb Stitch.

Smocking is often referred to as honeycombing, but this is a misnomer. Honeycomb stitch is a favourite smocking stitch and, as the name implies, it gives a honeycomb appearance to the surface of the work. It may be worked in bands or in points, and two rows of dots are worked simultaneously. Pairs of pleats are drawn together alternately. Commence in the top left-hand corner and take up a stitch through the tip of two pleats. Bring the needle out just under the point where the thread was first brought out. Bring the needle

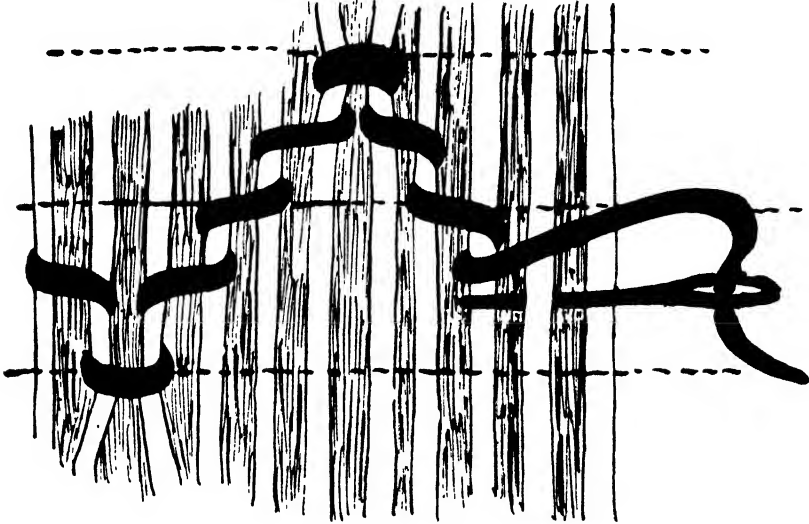


FIGURE IV.—Outline stitch forming diamonds.

over to the right side of the second of the two pleats and slip the thread up inside the pleat to the upper row of dots. Now the second dot may be worked and when this has been done, the needle is passed down inside the pleat to the original row of dots. Continue in this manner to the end of the row. In the following row the top stitches are worked on top of the lower stitches of the previous row. In this design the thread is carried in the folds of the pleats.

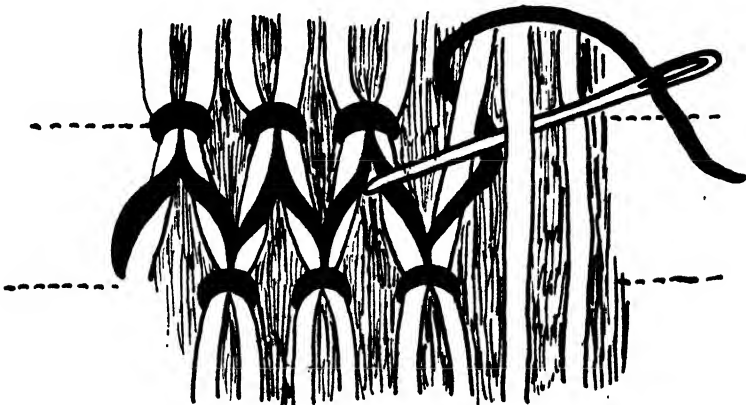


FIG. V.—Surface Honeycomb stitch.

When making points, each must be made separately. The number of dots worked is decreased by one at each end of every row.

SMOCKING.

(6) Surface Honeycomb Stitch.

In this stitch the thread is carried on top of the pleats and instead of bringing the needle out at the starting-point, it is brought out between two pleats. Commence in the top left-hand corner as for ordinary honeycomb stitch. Take a stitch through the tips of the first two pleats, and instead of bringing the needle out immediately

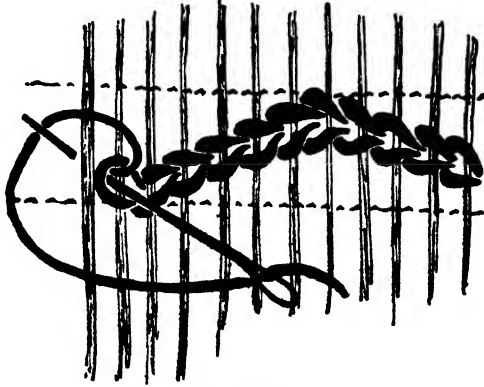


FIG. VI.—Chain stitch.

below the spot where it was first brought out, take it down to the following row of gathering stitches and make a stitch over the same pleat, as above. The thread will now lie on the surface. Make a second stitch through the next pleat. Bring the needle out between these two pleats and then take in the same pleat in the top row of

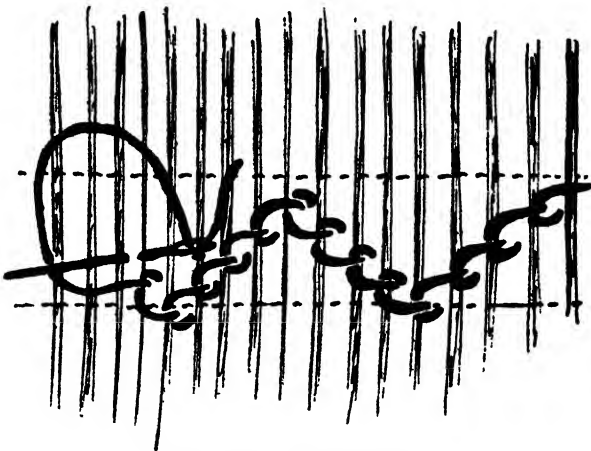


FIG. VII.—Feather stitch.

gathering stitches, keeping the thread behind the needle. Continue in this manner to the end of the row. A second row may be worked on the next row of gathering stitches, but first work upwards this time instead of downwards. This gives a honeycomb appearance (Figure V).

(7) Chain Stitch.

This embroidery stitch may be used very effectively in smocking. Two pleats are caught up with each stitch and only one stitch made at a time. Work from right to left (Figure VI).

(8) Feather Stitch.

This is an easy stitch and is exactly the same as that used in ordinary embroidery work. Work from right to left and pick up one pleat with each stitch. A diamond pattern may be worked by making two rows of feather stitch in Vandyke points, so that the top edge of the second row touches the lower edge of the first row. (Figure VII.)

The Choice of a Design.

If a border pattern is to be worked, an outline or similar stitch which will keep the folds of the material in place, may be used for the top and bottom. If the design is to be used for a yoke, however, the top edge must be worked in a firm stitch which will gather the material, and the lower edge in points which will allow the material to hang loosely. In this case outline stitch in Vandyke points, honeycomb stitch in rows or points, or any other stitch in points may be used. The smocking is successful if the yoke keeps its shape and the width of the article at the bottom is emphasized.

Finishing off Smocking.

Iron the work lightly on the right side before the gathering stitches have been removed. Place a damp cloth over the work and steam the design, if necessary. Now remove the gathering threads and stretch out the work. Pin out to the desired size with the right side facing a thick ironing blanket. Iron lightly with a moderately hot iron. Do not let the iron rest on the material. If the design is diamond-shaped, the material is held together in the large spaces by means of French knots and rosebuds worked in bouillon stitch.

The article is then made up. Frocks for little girls are always made with a double yoke and a 4 to 5-inch hem secured with blind stitch. French seams are used and are usually made by hand. Small puffed sleeves with a smocked border are popular or else plain little sleeves are put in.

The Destruction of Harmful Birds :—

[Continued from page 902.]

possible. Strain away the water through a sack and spread out the mealies in the sun to dry. The maize should be stirred a few times while drying so that it becomes glazed and the tar hard. This maize will germinate normally and will go through the planter without any trouble, and the crows will not feed on it.

Once again the author wishes to remind farmers and fruit growers that the damage done by birds is often exaggerated and that the good they do is usually overlooked.

They should not be destroyed unless this is *absolutely necessary*.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26

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Price Review for September, 1947.*

Fruit.—All markets were reasonably well supplied with cold storage apples and oranges. Larger quantities of tropical fruit reached the markets, especially papaws and pineapples. Prices of papaws decreased from 2s. 10d. to 2s. 6d. per standard box and pineapples from 5s. 2d. to 4s. 5d. per dozen on the Johannesburg market.

Tomatoes.—Supplies decreased on all markets and prices as a result increased from 2s. 9d. to 4s. 1d. per tray on the Cape Town market and from 3s. 10d. to 7s. 2d. per tray (National Mark No. 1) on the Johannesburg market.

Onions.—Reasonable supplies reached the markets. Prices were on a higher level and on the Johannesburg market prices increased from 22s. 5d. to 43s. 1d. per bag for Transvaal onions, and from 42s. 8d. to 50s. 10d. per bag for Cape onions.

Potatoes.—Supplies gradually decreased during the month and prices increased on most markets, e.g. from 16s. 2d. to 17s. 6d. per bag for Grade I on the Johannesburg market.

Vegetables.—Supplies of cauliflower and cabbages were smaller, but a reasonable supply of green beans, green peas, carrots, lettuce and beetroot were received.

Seeds, Grains and Feedstuffs.—The supply of hay was generally small. Teff supplies were of inferior quality with the result that prices on the Johannesburg market decreased, viz. from 5s. 2d. to 4s. 10d. per bale. Lucerne hay prices, however, remained firm.

* All prices mentioned are averages.

Eggs and Poultry.—The markets were all well supplied. The prices of Grade I large eggs decreased from 1s. 10d. to 1s. 9d. per dozen on the Johannesburg market and from 1s. 10d. to 1s. 8d. per dozen on the Durban market. There was also a decrease in the prices of fowls.

Agricultural Conditions in the Union during September, 1947.

Weather Conditions.—Except for the greater part of the Transvaal which had light showers of rain, good showers occurred throughout the rest of the Union, and brought relief everywhere.

Crops.—The prospects for winter cereal crops were very promising, and good harvests are expected, provided timely showers occur later in the season. In certain parts of the Transvaal and the Orange Free State farmers were very busy ploughing and planting for summer cereals.

Stock and Pastures.—As a result of the rain the stock and pastures improved, but in the northern part of the Transvaal, as well as in the Lowveld, the condition of the veld was, however, very poor, and stock losses occurred. Lumpy skin disease still occurred in the western and south-western Cape Province and in the Transkei, and nagana in Natal.

The Production of Karakul Pelts in the Union.

During the war the demand for karakul pelts increased considerably. This increase in the demand meant exceptionally remunerative prices for karakul breeders in the north-western districts of the Cape Province and a big expansion in production took place, particularly in these parts.

In the table below the number of pelts handled by the South African Karakul Breeders Company, Limited, Upington, is given as from the season 1942-43 up to and including the 1945-46 season, as well as the average price per pelt.

Year.	Number of Pelts.	Average Price Per Pelt.
1942-43.....	63,000	s. d. 20 0
1943-44.....	110,000	35 9
1944-45.....	150,000	33 4
1945-46.....	197,000	40 11
1946/to date.....	330,000	40 5

The ever increasing number of pelts handled by the Company since the season 1942-43 is an indication of the rapid expansion in production.

Review of the Groundnut Industry in the Union.

The production of groundnuts in the Union was never very high. It varied between 100,000 and 300,000 bags per 100 lb. unshelled.

As a result of the world shortage of fats and oils, it was decided last season to encourage the production of groundnuts in the Union. A groundnut loan scheme was again instituted for this purpose, and the Groundnut Advisory Committee, which was dissolved during 1944, was again re-established on a modified basis, designed to extend representation to the new producing areas.

Consequently, production increased considerably and a bumper groundnut crop, estimated at about 600,000 bags of 100 lb. unshelled, was harvested.

A still bigger expansion in the production is expected for the season 1947-48.

The prices for the 1947-48 season are somewhat lower than those for the 1946-47 season. As a result of the recommendations of the Groundnut Advisory Committee the Minister of Agriculture decided to fix the price to the oil expressers at £56. 10s. per ton f.o.r. for shelled groundnuts of at least Q2 quality, and in quantities of not less than one ton.

After providing for shelling costs at 10s. per ton, this price equals 33s. 7d. per 100 lb. for unshelled groundnuts. The corresponding price to oil expressers was £61 per ton for the 1946-47 season and equals 35s. per 100 lb. for unshelled groundnuts. Prices were fixed only for shelled groundnuts in view of the fact that the large majority of future groundnut crops will be used in a shelled condition.

The price for the coming season has been fixed after a discussion between the Groundnut Advisory Committee and the Oil Expressers' Association, on which occasion the expressers indicated their difficulties regarding the disposal of edible oils at the present high prices especially where an increased local crop will constitute the major portion of the available quantity of groundnuts.

In spite of the somewhat lower price for the coming season, groundnut prices are, however, still fairly high compared with the controlled prices of other important agricultural products, as appears from the following table showing the indexes of producers' prices of groundnuts and a few other agricultural products.

Season.	Groundnuts.	Maize.	Wheat.
1936-37—1938-39.....	100	100	100
1943-44.....	263	168	183
1944-45.....	297	184	183
1945-46.....	315	200	191
1946-47.....	377	237	206
1947-48.....	353	224	208

The Wool Market.

At the beginning of the war, the sale of wool by public auction was discontinued, clips thereafter being disposed of to the British Wool

Commission at fixed prices under agreement. Between 1940-41 and 1945-46 the country's entire production was sold in this way.

From the beginning of the 1946-47 wool season the open market was again introduced and all wool was again offered by public auction at the four Union ports, as was the case in pre-war years.

In order to effect the orderly disposal of accumulated surpluses of wool and at the same time maintain an appropriate degree of price stability, a New Wool Agreement has been concluded between the Governments of the United Kingdom, Australia, New Zealand and South Africa. A Joint Organization, known as the United Kingdom Dominion Wool Disposals, Limited, has been inaugurated for this purpose.

In order to cover the costs of the scheme a wool levy of $7\frac{1}{2}$ per cent. has been imposed. Owing to the high prices realized by Union Wool during the opening month of the 1947-48 selling season, it was decided to reduce the levy from $7\frac{1}{2}$ per cent. to 5 per cent.

The Directors of the Joint Disposals Organization again reviewed the wool-price aspect of the industry and fixed the basic prices for the 1947-48 season at an average of approximately 8 per cent. higher than that of the previous season.

Review of the Wool Market during September, 1947.

The first auction sale of the new wool season was held in Port Elizabeth on the 9 September, 1947, while sales at Cape Town commenced on the 11 September, 1947. No sales were held at Durban and East London during September.

In all 54,399 bales were offered for sale at Port Elizabeth and Cape Town auction markets during September and 40,206 bales (73 per cent.) were sold.

The market opened on higher levels than in 1946-47 and competition was keen, particularly for free washing wools. Offerings consisted mainly of karroo wools. Towards the end of the month the demand weakened somewhat, particularly in the case of super spinners and prices decreased slightly.

Index of Prices of Field Crops and Pastoral Products.

This index which appears elsewhere in this issue, increased from 200 the previous month, to 218 in September, 1947.

The most important changes occurred in the following groups:—

- (a) "Other Field Crops", i.e. potatoes, onions, sweet-potatoes and dry beans increased from 213 to 229 as a result of an increase in the prices of potatoes, onions and dry beans.
- (b) "Pastoral Products" increased from 176 to 228 owing to a considerable increase in the prices of wool.
- (c) "Slaughter Stock" show an increase from 196 during the previous month to 200 in September as a result of a further rise in the seasonal prices of slaughter cattle.
- (d) "Poultry and Poultry Products" decreased from 188 to 169 due to a further price decrease of eggs.

CROPS AND MARKETS.

Prices of Avocados and Papaws on Municipal Markets.

SEASON	AVOCADOS (Per Tray). (a)					PAPAWS. (b)						
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban Tray.	Johannesburg.		Port Elizabeth Std. Box.	Bloemfontein Std. Box.		
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.				
1938-39	1 4	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40	1 4	0 11	1 3	1 11	2 0	0 10	1 7	2 0	2 0	1 8	1 8	1 8
1940-41	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6	1 6	1 6
1941-42	1 16	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9	1 9	1 9
1942-43	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0	2 0	2 0
1943-44	3 1	1 8	2 10	4 8	3 2	1 2	2 1	2 7	2 2	2 0	2 0	2 0
1944-45	3 1	1 6	3 7	5 2	3 2	1 5	2 5	3 5	3 3	2 7	2 7	2 7
1945-46	3 8	1 8	3 0	5 10	3 4	1 6	3 1	4 1	3 5	3 0	3 0	3 0
1946-47	3 8	2 5	3 11	5 10	3 6	1 6	3 6	4 5	3 7	3 3	3 3	3 3
1947-	—	—	—	—	3 2	1 6	3 2	4 8	3 3	2 9	2 9	2 9
1948-	1 1	1 9	5 6	0 3	4 11	2 7	5 4	6 0	6 3	4 11	4 11	4 11
January	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4	4 4	4 4
February	8 8	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11	2 11	2 11
March	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10	1 10	1 10
April	8 6	3 6	6 3	7 4	2 8	0 8	2 3	1 11	2 11	2 8	2 8	2 8
May	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6	2 6	2 6
1947-	7 11	—	5 5	—	4 6	1 8	4 10	6 6	8 0	3 9	3 9	3 9
January	2 6	—	2 11	—	4 9	1 5	7 10	—	8 11	—	—	—
February	2 0	2 1	2 11	3 11	6 5	3 10	8 2	8 1	—	3 5	3 5	3 5
March	2 7	1 2	2 7	3 6	6 1	1 6	6 0	6 0	7 2	4 7	4 7	4 7
April	2 2	1 2	3 6	4 9	3 7	2 0	3 10	5 2	4 1	3 3	3 3	3 3
May	2 8	1 4	3 9	4 5	3 2	1 8	3 10	4 5	3 0	3 3	3 3	3 3
June	3 8	1 5	4 5	5 11	3 6	1 11	3 2	4 0	3 0	3 2	3 2	3 2
July	5 0	2 2	5 2	5 11	2 11	1 3	2 7	3 1	2 9	3 0	3 0	3 0
August	5 6	3 6	1 11	5 5	2 0	1 0	2 4	2 8	2 0	2 5	2 5	2 5
September	—	—	—	—	—	—	—	—	—	—	—	—

(a) Season 1 January to 31 December.

(b) Season 1 April to 31 March.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (a)		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
1938-39	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1940-41	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1941-42	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1942-43	2 7	8 10	2 6	3 11	3 3	3 4	8 5	8 11	17 2
1943-44	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1944-45	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1945-46	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1946-47	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1947-	3 11	3 7	3 6	4 10	4 3	5 0	5 9	4 9	14 11
1948-	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
January	6 8	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
February	6 6	7 5	0 4	5 0	4 11	5 1	3 8	3 2	10 11
March	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
April	2 11	2 7	1 11	6 5	3 10	9 5	6 3	5 7	11 5
May	3 9	2 8	2 5	9 0	—	7 0	7 6	3 4	19 5
1947-	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
January	4 2	—	5 1	3 2	—	5 8	10 4	—	12 8
February	3 5	—	2 8	5 3	—	7 5	16 8	20 0	24 5
March	2 7	2 5	2 1	6 7	5 1	7 8	13 4	4 11	27 1
April	3 0	3 3	2 5	9 0	4 0	4 8	8 10	18 8	23 8
May	2 11	3 4	4 3	5 9	4 4	3 7	7 1	17 11	16 7
June	6 0	4 6	5 2	5 8	5 5	4 11	6 0	11 7	15 11
July	10 2	9 1	8 0	5 0	3 8	3 4	9 3	7 7	13 7
August	3 9	5 4	2 8	3 6	3 0	2 10	6 4	7 0	9 0
September	—	—	—	—	—	—	—	—	—

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb. Town, 90 lb.; and Durban, 120 lb.

Index of Prices of Field Crops and Animal Products.

(Basic period 1838-37 to 1838-39=100.)

SEASON (1 July to 30 June).	Summer cereals.	Winter cereals.	Hay.	Other field crops.	Pastoral products.	Dairy products.	Slaughter stock.	Poultry and pothouse products.	Com- bined index.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
WEIGHTS.....	19	13	2	3	34	6	17	1	100
1938-39.....	92	109	96	89	79	102	188	14	100
1939-40.....	86	114	77	95	115	105	106	13	100
1940-41.....	108	120	106	156	102	108	110	10	100
1941-42.....	120	144	143	203	102	181	185	10	100
1942-43.....	160	157	144	159	122	147	188	10	100
1943-44.....	170	186	137	212	122	154	186	10	100
1944-45.....	183	186	160	281	122	177	179	10	100
1945-46.....	201	194	164	312	118	198	185	10	100
1946-47.....	241	209	149	232	169	205	192	10	100
1946—									
July.....	245	194	182	303	120	231	183	10	100
August.....	242	194	181	319	120	231	186	10	100
September.....	243	194	183	351	163	231	196	10	100
October.....	240	194	166	365	171	231	204	10	100
November.....	240	210	165	309	179	194	208	10	100
December.....	242	210	157	236	168	194	208	10	100
1947—									
January.....	242	210	144	174	178	194	200	10	100
February.....	240	210	127	157	187	194	191	10	100
March.....	240	210	154	158	189	194	182	10	100
April.....	239	210	176	169	190	194	179	10	100
May.....	225	210	166	187	192	194	183	10	100
June.....	225	210	169	213	174	247	186	10	100
July.....	224	210	184	216	175	261	191	10	100
August.....	225	210	184	213	176	261	196	10	100
September.....	226	210	184	220	228	261	200	10	100

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.

(d) Potatoes, sweet potatoes,
onions and dried beans.
(e) Wool, mohair, hides and skins.

(f) Butterfat, cheese milk and
condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1 July to 30 June).	CABBAGES (Bag). (a)			CAULIFLOWER (Bag). (a)			TOMATOES (Trays 15 lb.).			
	Johan- nesburg.	Cape Town.	Durban.	Johan- nesburg.	Cape Town.	Durban.	Johannesburg.			
							N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.....	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940-41.....	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941-42.....	8 10	5 6	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942-43.....	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943-44.....	11 1	7 4	17 6	9 2	6 2	12 1	5 5	2 9	3 7	2 0
1944-45.....	9 7	6 11	13 5	7 5	6 6	9 8	4 1	2 0	2 10	1 9
1945-46.....	10 1	7 1	10 11	8 4	6 5	11 1	4 11	2 4	3 4	1 7
1946-47.....	6 7	6 4	10 6	8 4	11 2	10 5	4 3	2 5	2 8	2 5
1946—										
July.....	7 11	1 10	9 9	8 6	—	11 3	2 2	1 1	2 3	1 0
August.....	5 9	2 1	7 1	8 9	3 2	11 1	2 5	1 3	1 11	0 9
September.....	4 11	2 5	5 8	9 6	4 0	13 7	3 2	1 9	2 2	1 1
October.....	5 6	8 0	7 0	15 10	13 7	12 0	4 5	1 9	2 8	0 11
November.....	5 7	11 5	12 0	13 4	15 1	—	5 2	2 1	3 4	1 1
December.....	8 9	9 11	11 11	11 10	—	—	4 8	1 11	3 0	1 10
1947—										
January.....	9 0	12 3	5 9	11 3	23 8	—	5 0	2 0	2 11	1 6
February.....	11 4	14 10	14 3	12 5	15 2	—	5 6	2 3	3 4	3 1
March.....	12 0	17 2	17 6	12 1	16 6	31 5	7 10	3 9	4 0	2 9
April.....	7 1	14 9	16 0	6 2	14 2	11 9	6 2	2 9	3 8	2 3
May.....	6 8	10 4	12 1	7 0	9 9	9 5	7 4	3 3	2 10	2 5
June.....	6 1	8 3	8 6	8 5	8 8	9 0	5 2	2 5	4 4	1 11
July.....	6 0	6 0	7 0	7 4	7 6	9 10	3 3	1 8	2 8	1 9
August.....	4 1	7 3	5 5	5 1	10 3	5 5	3 10	1 11	2 9	1 3
September.....	4 5	7 0	4 4	9 1	10 0	5 9	7 2	3 0	4 1	1 3

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 150 lb.; Cape Town, 105 lb., and Durban, 90 lb. For cauliflower—Johannesburg, 100 lb.; Cape Town, 65 lb. and Durban, 55 lb.

CROPS AND MARKETS.

Prices of Bananas and Pineapples on Municipal Markets.

Season.	BANANAS (Per Crate) (a)			PINEAPPLES. (b)						
	Cape Town.	Johannesburg.	Pretoria.	Cape Town. Box.	Durban. Doz.	Johannesburg.		Port Elizabeth. Box.	East London. Doz. Large.	Bloemfontein. Bushel Box.
						Ordinary. Doz.	Queens and Giants. Doz.			
1938-39	22 5	9 10	16 5	5 4	3 3	1 1	—	3 5	1 2	4 10
1939-40	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
1940-41	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941-42	28 6	7 8	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942-43	32 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3
1943-44	37 5	13 2	18 10	8 3	3 6	2 4	2 1	6 3	2 10	8 4
1944-45	38 10	13 0	15 3	10 4	3 9	2 6	3 9	7 3	3 3	8 6
1945-46	37 0	20 1	28 7	10 4	4 7	4 1	4 8	8 11	3 11	10 7
1946—										
January	20 11	25 4	25 8	15 7	3 2	9 3	10 3	15 5	5 7	13 5
February	23 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10
March	26 6	20 6	30 8	10 1	7 7	6 5	7 2	12 2	4 7	13 11
April	28 10	28 6	34 6	15 5	6 5	6 9	6 5	13 10	4 3	14 5
May	28 8	47 10	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11
June	27 7	30 7	35 4	16 5	4 5	7 0	—	11 11	4 7	17 8
1947—										
January	41 7	20 2	20 4	9 2	5 1	2 3	3 6	6 8	3 6	7 5
February	46 0	14 10	15 10	6 10	2 0	2 0	2 7	5 4	3 7	6 8
March	47 5	18 4	22 10	9 3	—	3 6	—	8 3	5 2	11 8
April	57 2	24 8	23 8	12 9	—	4 5	—	9 5	4 1	13 10
May	62 0	20 1	26 8	7 11	—	4 3	—	8 2	4 4	9 6
June	32 7	19 6	23 11	9 3	—	3 8	—	6 11	2 11	9 6
July	55 1	17 6	23 4	7 3	—	4 3	—	7 5	3 7	8 7
August	44 6	20 4	16 9	8 5	7 2	5 2	—	9 9	3 1	9 11
September	55 8	21 10	21 7	9 10	—	4 5	—	8 0	3 7	8 4

(a) Season 1 January to 31 December.

(b) Season 1 October to 30 September.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

Season (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannesburg. Table.	Durban.	Cape Town.
1938-39	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1939-40	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1940-41	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1941-42	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1942-43	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1943-44	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1944-45	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1945-46	14 3	18 5	15 0	18 1	18 8	19 5	17 3	15 1	16 3
1946-47	12 4	14 11	12 9	15 3	14 9	15 7	14 11	13 5	14 7
1947—	21 0	19 0	17 4	19 3	23 2	20 0	16 3	14 6	16 11
1948—									
January	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
February	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
March	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
April	24 9	23 1	32 5	24 0	32 3	31 8	24 6	10 9	20 10
May	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
June	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1949—									
January	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 8
February	14 8	14 5	11 9	13 7	16 1	17 8	16 11	7 6	18 11
March	17 6	18 7	14 3	20 3	13 4	17 6	15 6	13 4	16 1
April	20 7	22 2	17 10	22 3	24 11	24 4	12 7	8 4	10 9
May	22 4	24 11	20 11	26 2	27 5	24 1	10 1	8 6	11 7
June	26 2	26 9	23 3	26 9	26 4	27 2	9 9	7 5	11 5
July	31 5	31 5	25 2	30 6	29 10	34 5	8 6	7 10	10 9
August	22 5	42 8	40 2	43 9	37 8	42 11	8 2	6 5	8 1
September	43 1	50 10	45 10	46 2	50 11	52 0	8 1	5 11	11 7

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season 1 July to 30 June.	Johannesburg.			Durban.		Pretoria.	Orange Free State.	
	Trans- vaal N.M. all classes. Grade I.	Transvaal.		Natal Ordinary No. I.	O.F.S. Ordinary No. I.	Trans- vaal N.M. all classes. Grade I.	Orange Free State N.M. all classes. Grade I.	Orange Free State N.M. all classes. Grade I.
		Ordinary No. I.	Ordinary No. II.					
1938-39....	s. d. 8 5	s. d. 6 9	s. d. 6 2	s. d. 8 10	s. d. 8 4	s. d. 8 5	s. d. 8 5	s. d. 8 5
1939-40....	8 4	6 7	6 7	9 10	8 9	8 3	8 3	8 3
1940-41....	18 4	14 2	13 4	16 10	17 1	15 10	15 10	15 10
1941-42....	24 8	19 3	18 7	23 3	21 0	25 1	25 1	25 1
1942-43....	16 4	13 7	12 6	16 9	17 8	16 6	15 0	15 0
1943-44....	28 10	17 1	15 0	23 6	19 4	20 5	21 2	21 2
1944-45....	25 6	25 1	19 2	25 5	24 4	25 4	25 4	25 4
(a)	Grade I.	Grade II.	Grade III.	Grade I, all classes.	Grade I, all classes.	Grade I.	Grade I, all classes.	Grade I, all classes.
1945-46...	30 11	24 11	15 9	28 9	29 8	29 6	30 11	30 7
1946-47...	20 5	16 3	13 0	18 8	24 3	19 6	23 1	15 11
1946—								
January..	34 8	30 9	19 5	34 1	—	35 8	31 6	—
February..	25 7	19 5	11 3	28 2	30 6	24 2	35 6	33 3
March....	23 9	18 3	11 7	26 3	25 11	24 0	29 8	29 5
April.....	27 0	22 2	13 8	28 4	36 8	27 3	31 1	32 6
May.....	27 3	21 5	13 1	23 2	29 1	25 2	27 1	27 11
June.....	28 0	23 3	15 8	25 8	25 9	29 0	30 8	30 4
July.....	28 8	23 11	16 2	31 11	32 0	31 3	31 5	32 10
August...	31 9	26 1	16 0	33 6	32 5	33 2	33 2	34 6
September	35 8	28 0	17 7	35 9	36 6	35 6	33 11	34 6
October...	36 3	29 2	20 11	36 10	37 2	33 11	34 6	—
November	26 10	23 5	16 0	33 9	33 10	24 8	28 11	—
December	18 11	16 0	12 1	26 6	29 9	19 6	19 4	—
1947—								
January..	12 4	9 0	6 5	15 1	—	11 8	15 6	15 1
February..	10 1	7 9	5 9	12 7	12 11	9 9	15 5	14 9
March....	9 6	7 2	5 10	14 0	9 10	9 7	12 9	13 5
April.....	11 5	8 2	6 3	12 10	11 7	11 10	15 3	13 11
May.....	12 8	9 10	7 4	17 8	17 6	12 8	18 0	14 7
June.....	17 4	13 4	9 5	18 7	16 11	17 5	21 11	17 8
July.....	16 11	12 5	7 11	20 1	19 4	16 1	22 11	18 0
August...	16 2	10 5	6 5	16 7	16 3	15 2	21 6	20 10
September	17 6	10 8	6 7	16 0	13 3	18 5	28 8	18 11

(a) As from July 1945 compulsory grading was introduced on the nine controlled markets of the Union and the National Mark grades were abolished.

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[Photo on Cover: Students Stacking Maize. Glen Agricultural College.]

[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

Increase Our Agricultural Production!

Report of the Department of Agriculture for the year ended 31st August 1947.

Dr. C. H. Neveling, Secretary for Agriculture.

THE sturdy optimism, unfaltering perseverance in the face of adversity, and constant hopefulness so characteristic of the South African farmer, were once again strongly in evidence during the past year which was no exception to the rule and brought its quota of tribulations. Whereas the north-western Cape Province, after years of drought, received welcome rain during the year, the western Transvaal and Bechuanaland experienced the severest drought in their history; the wheat crops of the Orange Free State and eastern Cape Province which, at one stage, were so promising, were lost in the early summer drought and the Central Karroo had to struggle through a very trying winter hoping for relief in early summer rains.

The crop failures and stock losses following on the drought inevitably left their mark on agriculture. These are material and calculable losses which often run into considerable figures, but there remain those which cannot be calculated in terms of money, viz. the deterioration of veld and soil, and the deprivations suffered by so many families on our farms.

Food Production.

Against this background of adversity in one area and prosperity in another there was, however, a noticeable general improvement in the sphere of food production, as compared with the situation during the previous year. This is a very heartening feature, specially in view of the fact that this report last year offered such a sombre picture of the prospects for 1946-47 and the years immediately to follow, and emphasized in such strong terms the necessity for a supreme effort at increasing production. This improvement affords evidence of the Union's powers of recovery and clearly illustrates the salutary effect of a good maize crop—our staple agricultural product—on conditions in the country. For three consecutive years our farmers had crop failures, the total production amounting to only approximately 18,000,000 bags a year; the latest crop estimate for the present season puts the expected yield at approximately 24,600,000 bags.

Maize is justifiably regarded as the basic food product for man and beast in this country, and the shortages of a series of years, coupled with the restrictions placed on its consumption, caused dislocation in almost every field of activity. It is expected that the removal of these restrictions early in this report year, will lead to increased production of protective foodstuffs—an increase demanded by present circumstances in the Union and abroad.

The wheat crop was disappointing. At one stage a record yield of 6,000,000 bags was expected, but the actual production is now

estimated at only about 4½ million bags. It will, therefore, again be necessary to import wheat although there is as yet no certainty that supplies will be obtainable, even to meet only part of our requirements. As has already been pointed out on other occasions, a return to white bread remains a matter for the future.

Potatoes are the only product of which a surplus was produced—a surplus of such dimensions that the Union actually had to resort to export. Maximum prices were abolished, but special measures had to be taken to stabilize prices to producers and to prevent a collapse of the potato market.

In the case of dairy products the contrary is true, in that production fell as compared with that of the previous year, with the result that at the end of the report year only a 50 per cent. issue could be maintained.

Cheese production, although reasonably steady, remained totally inadequate. Distribution is still taking place on a 66 per cent. basis. Fresh milk was fairly abundant at ruling prices and there are signs of over-production. This had an adverse influence on the production of condensed milk which, however, is more satisfactory than during the previous year and is being maintained at a reasonable level.

Meat production shows some improvement and slaughtering has increased in the case of both sheep and cattle, which necessarily indicates increased consumption. Periodic shortages were, however, inevitable.

Agriculture is still feeling the impact of many of the handicapping influences which, during the war years, had such a limiting effect on the production efforts of our farmers. The labour problems of the latter show no improvement; on the contrary, the general efficiency of farm labourers has declined. Moreover, wages have risen considerably. The combined influence of the foregoing has had a profound effect during the past eight years, and the total yield of the agricultural industry necessarily suffered. The Department, however, has never doubted the ability of the farming community to continue, with renewed and determined efforts, to increase production. As has already been pointed out, concern is felt especially in regard to cereal production, and the nation is looking to agriculturists to provide the country's food, always remembering that this is possible only if climatic conditions are favourable, since the precarious nature of our rainfall still remains the farmer's most serious handicap.

World Conditions.

Although shortages of various products did occur during the course of the year, the general food position in the Union undoubtedly showed an improvement, which is a very encouraging sign if it is borne in mind that the past year proved to be one of the most difficult the world has ever experienced in regard to food. In actual fact, conditions were and still are extremely critical. More than anything else the world cereal position is alarming, in spite of the exceptionally heavy wheat crop harvested in the United States of America, and informed circles are of the opinion that the cereal position will deteriorate still further during the coming year. Cereals, especially wheat, rice and maize, constitute such an important item in the daily diet that the aggregate available supplies of these food-stuffs determine the world food position. There are indications

INCREASE OUR AGRICULTURAL PRODUCTION!

that this cereal shortage may continue for several years, and even in regard to the production of meat, dairy products, eggs, fats and oils, as much as four to five years may elapse before an improvement can be effected.

Agriculture in the Union will have to keep this picture of the world food position in mind when planning its production programme for the future. Manifestly it will be the task of our farming community to provide food for the nation. On their part they demand, and quite justifiably, prices commensurate with their efforts and State assistance in regard to the acquisition of the means of production.

Prices.

Economic prices are generally accepted as a powerful stimulus to increase production, but excessive prices and uncontrolled fluctuations necessarily lead to decreased consumption with resultant overproduction and falling prices. It has often been emphasized that the Marketing Act offers the machinery for preventing price fluctuations and created a system of controlled marketing in order to ensure a stable price to the producer for his chief agricultural products. It may be necessary to mention here that the machinery of the Marketing Act has already been used to fix prices for products like maize, wheat and other winter cereals, dairy products, citrus fruits, fresh fruit, dried fruit, chicory and tobacco. In addition, prices have been fixed for meat and maximum and minimum prices prescribed for eggs and groundnuts respectively; a reserve price is in operation in the case of wool, and a Control Board has been instituted for the potato market. All these measures were instituted with a view to securing stability in agriculture; they serve as a guarantee to the producer that the authorities are seriously determined to secure a remunerative price for his products. There is no reason, therefore, why our farmers should hesitate to increase the production of essential commodities to a maximum.

Hesitation and an insistence on advance announcement of prices can only mean an absence of the necessary confidence in the ability of the Marketing Act and the Control Boards to ensure reasonable and stable prices to the producer. Furthermore, the announcement of prices in advance is fraught with danger for both producer and consumer. The principle adopted in the Marketing Act, viz. that prices are to be fixed annually on the basis of production costs and after taking into account general price tendencies and price relations, especially of agricultural products, offers greater security for producers as well as consumers. The agricultural industry should guard against making demands calculated to undermine and obstruct the application of the principles of the Marketing Act.

Instruments of Production.

The continued shortage of the means of agricultural production, however, remains a handicapping factor. In this regard, fertilizer and agricultural implements undoubtedly are the most important requisites.

Fertilizer.

Although the position in regard to fertilizer shows considerable improvement, the available supplies remain inadequate for the needs

of South African agriculture. It was, therefore, necessary to maintain control of fertilizer with a view to ensuring equitable distribution.

It has been estimated that the Union in normal circumstances requires about 550,000 tons of superphosphate, nitrogenous fertilizer and potash fertilizer, of which superphosphate constitutes 500,000 tons, i.e. approximately 90 per cent. It is therefore abundantly clear that strong efforts have to be made to safeguard the position in regard to superphosphate, either by means of increased production or through importation. The realization that our soils, in addition to phosphate, also require other plant nutrients has led to an increasing demand for the other two fertilizers. The wheat farmers in the western Cape Province are finding it almost impossible to produce a reasonably large wheat crop without the aid of nitrogenous fertilizer, and on the Transvaal Highveld the potato farmers are using fertilizer mixtures containing, in addition to phosphates, both nitrogen and potash. It is also believed that nitrogen is of greater importance than phosphates for the production of best quality citrus fruit, grapes and other fruits.

It is, therefore, necessary to give serious consideration to these two fertilizer components, with a view to increased production of the various important crops.

During the past year, the production figures of the two factories processing rock phosphate into superphosphate, reached the 320,000 ton mark; when the third factory reaches the production stage towards the middle of next year the annual production will, it is hoped, be increased to 500,000 tons. It may be necessary to retain some measure of control in regard to distribution in 1948, but thereafter it should be possible to abolish control. The rock phosphates required for these factories are being imported from Egypt and Morocco, and although international control of phosphates and potash has been discontinued and the Union is free to import its requirements at will, transport difficulties and high prices remain limiting factors. An improvement has been effected, however, in that the Union is now importing larger supplies of Moroccan high quality rock phosphates and less of the poorer quality Egyptian rock phosphates. Importation of superphosphate and other manufactured phosphatic fertilizers is taking place on a small scale only, on account of the high prices demanded and the serious shortage still being experienced in European countries.

Mention has been made of the fact that potassium has been removed from international control and that the Union is free to purchase and import its requirements free from any control whatsoever, but in regard to nitrogenous material the situation is less satisfactory. Obviously the present world shortage is more acute than ever before; allocations to the Union are totally inadequate—a situation which has been aggravated by the extremely unreliable shipping service. The Department has therefore been compelled to resort to strict rationing of available supplies and to limit the use of this commodity to the country's most imperative needs.

In regard to kraal manure, supplies must now be obtained further afield, with consequent increase of transport costs from dumps to railway loading points. The position, therefore, has deteriorated somewhat, but otherwise remains unaltered.

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Speaking generally, the prices of all types of fertilizer have been maintained at the same level as during the preceding year; the subsidy of £1 per ton on certain fertilizers is still available.

Fertilizer is one of the four products forming the subject of the Fertilizer, Farm Feeds, Seeds and Remedies Act, 1947, to which reference is made subsequently in this report.

Agricultural Implements and Machinery.

The acute shortage of implements and machinery during the past year once again proved to be one of the most serious problems confronting agriculture in this country. The position was especially difficult in regard to heavy machinery, the trade experiencing the greatest difficulty in trying to provide even a small percentage of the requirements of the agricultural industry in regard to tractors, tractor ploughs, etc. The small numbers of these implements which could be imported were totally inadequate to meet even the most urgent needs, and consequently the prices of used implements and machinery rose considerably.

In certain respects the position during this report year would appear to have been almost as difficult as during the previous year, if not in fact more difficult, and there are no indications of any immediate and considerable improvement, in spite of the fact that the Government has taken all possible steps to secure relief for our farmers.

The local manufacture of certain types of agricultural implements which was so intensively maintained during the war, is partially supplying the needs of the farming community, but there are still many types of implements and machinery which must be imported. This local industry has already reached the stage at which it is able to export articles to Rhodesia and East Africa.

The Bag Position.

Bearing in mind the fact that the Union is largely dependent on importation as far as its requirements in regard to bags are concerned, and the serious difficulties encountered during the past year in its attempts at securing supplies by this means, I wish to express the Department's gratitude to the community in general and our farmers in particular for their co-operation with the Government in this difficult situation, especially in regard to the marketing, sale and consumption of agricultural products. Producers as well as the trade often had to experience acute inconvenience, and it was only through the general co-operation of all interested parties that the emergency measures which were taken could achieve the degree of success which finally attended their efforts. The same co-operation was obtained from farmers, co-operative societies and the maize trade in regard to the steps necessary for successfully storing the maize crop. These achievements were not possible without sacrifice.

When, early in 1946, it became necessary to decide on the measures to be taken with a view to making grain bags available for the maize crop, the prospects were that only about 4,000,000 bags would be available; in the event it proved possible for the Controller of Jute Goods, at the close of the report year on 31st August, 1947, to allocate approximately 6,000,000 bags for the maize crop. A considerable proportion of this total consisted of used bags withdrawn from the trade for the specific purpose of gathering and

marketing the maize crop. To these figures may be added those of the carry-over supplies from the previous season held by producers on their farms.

During the past year more extensive use was also made of paper and cotton bags, although the world shortage of paper remained a stumbling block. Cotton bags are, however, reasonably abundant and readily available, although the high price must be regarded as a limiting factor.

The marketing of other agricultural products in inferior bags and bags of different sizes and material gave less difficulty, and the supply position in regard to such bags is fairly good.

The establishment of a bag industry in the Union was intensively encouraged during the past year, and considerable progress was made in this direction. It is hoped that this new industry will, in the coming year, reach a stage at which it will be able to contribute its quota of our bag requirements. The production for 1948 is expected to be in the neighbourhood of 2,500,000 bags. Planting of the wild stock-rose for the production of raw material for this industry is also being intensively encouraged.

The bag problem is therefore actually being tackled from three sides, viz. through conservation of existing supplies, importation of jute, paper and cotton bags and the development of a national bag industry.

At present the prospects in regard to the harvesting of the coming wheat crop are not too promising. Serious thought is being given to possible arrangements for harvesting and storing the crop. It will probably be necessary to utilize bags of smaller than standard size for this purpose, e.g. sugar pockets. Reasonable supplies of these types are available.

With a view to making available, for maize and wheat, every possible bag that can be spared, only cotton bags are now being used for flour and meal; at the same time an appeal is being made to producers to conserve their stocks and to make each individual bag last as long as possible. Consumers are also being requested to return all empties to circulation in the trade.

Storing the Maize Crop.

As early as the end of 1946 it was already clear that available stocks of grain bags would not be adequate for the handling and storing of the 1947-48 maize crop, and consequently it became imperative to give immediate consideration to measures designed to meet the critical situation which was bound to ensue.

The first step in this direction was the appointment of an inter-departmental committee of representatives from the Railway Administration, the Departments of Irrigation and Agriculture and the Mealie Industry Control Board to investigate the possibility of providing additional storing space.

The committee issued several reports and made various recommendations as more definite information was gathered in regard to the bag position and the size of the expected maize crop. The committee felt that extension of existing elevator space was the logical permanent solution, but the immediate problem confronting the committee was to decide on the best measures to be applied in bringing the coming crop under cover.

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The use of aircraft hangars and oil tanks was considered, and after it had become possible to determine with a fair amount of accuracy the extent of the crop, it was ultimately decided to take over from the Department of Defence 8 double and 9 single Bellman aircraft hangars and to erect these next to the existing elevators in certain maize areas; this would create additional space for the storage of about 790,000 bags of maize. It was also decided to contribute, on the £ for £ basis, towards the costs of approved measures taken by co-operative societies themselves for strengthening their sheds with a view to making available further space for the mass storage of maize.

These aircraft hangars were erected next to the grain elevators at Bethal, Kinross, Leslie, Standerton, Val, Balfour North, Frankfort, Heilbron, Kaallangte, Kroonstad, Rendezvous, Westminster, Potchefstroom, Makokskraal and Vermaas.

The programme was subsequently altered and 10 double and 5 single hangars erected, instead of 8 double and 9 single structures.

The cost, to the Government, of the erection of this temporary additional storage space for maize is estimated at a quarter of a million pounds.

It is obvious, however, that the handling of maize in bulk will in future be the rule rather than the exception, and the question of constructing additional grain elevators and/or extending the existing grain elevator space is a matter which is at present being further investigated.



Legumes for Soil Improvement.

II. The Principal Agricultural Products.

Maize.

The 1947/48 Season.

Rationing.—As has been mentioned in last year's report, the consumption of maize and maize products had to be drastically curtailed at the beginning of the 1946-47 season in order to make the limited supplies available go as far as possible. As the season advanced, however, and supplies could be obtained at regular intervals from outside the Union, especially from the Argentine, and the prospects for the coming harvest improved, it was realised that rationing could be lifted. The permit regulations were, therefore, repealed towards the end of the season (February 1947), and maize and maize products could consequently again be purchased and sold freely in the trade. The sale of maize by producers was, however, in no way effected by the lifting of the rationing measures, since in terms of the Mealie Control Scheme, producers could still, as in the past, dispose of their maize only to the Board, agents of the Board or to registered traders.

Although rationing has been abolished in the Union, it continued to exist in respect of maize sent to Basutoland, Swaziland and the Bechuanaland Protectorate, as the subsidy paid by the Government in respect of maize sold in the Union could otherwise not have been recovered from the areas concerned.

Imports.—In order to supplement supplies, maize was purchased outside the Union and the arrangements regarding the importation of maize from the Argentine made during the previous year continued. During the period 1 September 1946 to 31 August 1947, 2,695,889 bags of maize were unloaded at Union ports. All the maize was not fit for human consumption, however, as portions of some shiploads had become so mouldy owing to their high moisture content that they could be used as animal feed only. Maize from the Argentine was received in bulk and therefore had to be deposited in the elevators at the ports. Since the consumption in the coastal regions is limited, the major portion of the imported supplies had to be moved inland where the actual consumption is located. In addition, it was also necessary to move the maize as soon as possible after arrival to the drier inland climate, in order to prevent consignments from becoming mouldy as a result of the damp sea air. At times ships arrived in rapid succession and although the Railway Administration did everything in its power to cope with the situation, supplies were bound to accumulate at the ports. In order, as far as possible, to prevent supplies from becoming unfit for consumption, large quantities of maize were conveyed to the Wingfield Airport at Cape Town and to the inland co-operative warehouses where they were spread out and dried. For all this, however, some of the maize was so damaged by mould that it had to be disposed of at a reduced price, notwithstanding the fact that it could still be used as animal feed. The transportation of supplies and the steps that had to be taken to dry the maize involved enormous costs. In addition, the price of Argentine maize had to be reduced towards the end of the season in order to be able to dispose of it and this increased the costs still further.

Directions with Regard to Mixing.—The supplies received from the Argentine consisted mainly of yellow maize. Moreover, the Union's supplies of white maize were low owing to the fact that the previous crop was a failure, especially in those regions where white maize is produced. In these circumstances the supply of yellow maize was out of proportion to that of white maize and in order to make the latter go as far as possible, an embargo was placed on the manufacture of any maize products consisting exclusively of white maize. During the period under review it was compulsory at first that at least 60 per cent., by weight, of yellow maize should be admixed but as more and more supplies of Argentine maize became available, and since it was essential, owing to its high moisture content, that this maize should be consumed as rapidly as possible, the use of white maize by mills was prohibited. In consequence, the consumption of yellow maize rapidly increased and within a short time it was possible to lift the ban and to revert to the former ratio of 60 per cent. yellow maize to 40 per cent. white maize. As yellow maize was consumed and the position with regard to white maize supplies accordingly improved, an amendment was introduced and a ratio of 50-50 per cent. permitted. Meanwhile, practically all supplies of Argentine maize had been consumed and consequently the provisions with regard to the compulsory admixing of yellow maize could be totally abrogated on 17 May 1947. The ban on the sifting of meal-meal, however, remained in force, since the supply position was not as yet so favourable as to permit of its abrogation. Producers of maize are not affected by this, however, as the removal of 7½ per cent. bran and other waste products is permitted in respect of meal-meal manufactured for the producer's own consumption.

The 1947/48 Crop.

The new maize season commenced on 1 May 1947 with a crop provisionally estimated at 23,800,000 bags, but as the season advanced and the effect of the drought, which prevailed during the previous planting season and thereafter could be determined, it was found that prospects with regard to the crop were less favourable than originally expected. As more details regarding the crop prospects in the different areas became available, the provisional estimate had to be revised from time to time, and towards the middle of June 1947, it had dwindled to 23,200,000 bags. As actual deliveries took place it appeared, however, that the crop would be bigger. A later estimate placed the figure at 24,483,000 bags, but the actual size of the crop is still unknown, since this can only be determined at the end of the season. It can nevertheless be assumed that, provided nothing unforeseen happens, the new crop, together with the carry over from the previous season of 1,554,753 bags, will be adequate to provide for the normal requirements of the country until the next crop.

Control of Crop.—As during the previous three seasons full physical control was again exercised and accordingly the Board or its agents again acted as sole buyers of maize from producers in area "A", while only traders registered with the board could fulfil that function in area "B". As in the past, agents once again received compensation for their services in regard to handling and storage, but this varied depending on whether they were trading or milling agents. Owing to the shortage of grain bags it was evident from the outset that the handling and storage of maize would have to be done mainly in bulk, and in order to meet the additional costs

which would have to be incurred in this connection, it was decided to increase the compensation paid to agents.

Prices.—The following producers' prices were fixed for maize:—

	GRADE OF MAIZE.		
	White Dents No. 2, Yellow Dents and Yellow Flints.	White Dents No. 3, White Flints and Mixed.	No Grade (Known as Grade 8 White or Yellow.)
(a) For bagged maize.....	s. d. 21 3	s. d. 21 1	s. d. 20 10
(b) For maize represented by elevator receipts issued by the South African Railways and Harbours Administration....	20 0	19 10	19 7
(c) For maize in bulk other than maize represented by elevator receipts, delivered to the Board or to an agent of the Board..	19 7	19 5	19 2

The price of maize in quantities of less than one bag is fixed at 1d. per lb. while a minimum price of 21s. 3d. was fixed for maize intended for planting purposes. A maximum price of 20s. 8d. applies in respect of undergrade maize.

The maximum consumers' prices in respect of maize are as follows:—

Grade.	Price Per Bag.
	s. d.
White Dent No. 2, Yellow Dent and Yellow Flint.....	21 9
White Dent No. 3, White Flint and mixed.....	21 7
No grade (known as Grade 8 White or Yellow).....	21 4

The following maximum prices apply to maize products:—

MAIZE PRODUCT.	PRICE PER BAG.	
	Producers.	Traders.
	s. d.	s. d.
Un sifted granulated meal meal.....	20 9	22 3
Un sifted meal meal other than un sifted granulated meal meal.....	20 4	21 10
Sifted crushed maize.....	20 10	22 4
Un sifted crushed maize.....	20 4	21 10
Samp.....	26 2	27 8
Mealie rice.....	26 2	27 8
Maize flour.....	26 2	27 8
Baker's Cones.....	26 2	27 8
Maize grits.....	26 2	27 8
Germ meal.....	12 10	14 4
Hominy chop.....	11 4	12 10
Maize bran (fine or crude).....	7 0	8 6
Maize feed.....	7 0	8 6

THE PRINCIPAL AGRICULTURAL PRODUCTS.

The above-mentioned prices applied in respect of maize products contained in jute or hessian bags. In view of the compulsory use of cotton and linen bags for certain products, the prices had to be amended and were fixed at the following levels:—

MAIZE PRODUCTS.	PRICE PER 100 LB. BAG.	
	Producers.	Traders.
	s. d.	s. d.
Unsifted granulated mealie meal.....	12 7½	13 5½
Unsifted mealie meal other than unsifted granulated mealie meal	12 4½	13 2½
Samp.....	14 3	15 1
Maize flour.....	15 7	16 5
Baker's Cones.....	15 7	16 5
Maize grits.....	15 7	16 5
Mealie rice.....	14 11	15 9

The conditions with regard to prices that were applicable during the previous season, e.g. with regard to transport costs, railage, sales in small packs, price mark-ups in the case of credit sales, etc., again applied for this season.

These consumers' prices include the Government subsidy of 3s. 1½d. per bag in respect of maize, compared with 5s. per bag during the previous season when the producer's price was higher. In contrast to the previous season an additional subsidy is at present also being paid on maize products at the rate of 1s. per 197½ lb.

Levies.

Millers' Levy.—The levy on maize, ground, crushed, gristed or otherwise processed by a person dealing with maize in the course of the trade, which has been increased from ½d. to 4d. per 200 lb. during the previous season has been decreased for the season under review. At first it was again fixed at ¾d., but owing to uncertain factors in the price structure caused chiefly by the compulsory packing of certain maize products in cotton or linen bags, this levy was increased to 2d. per bag with a view to the establishment of a fund from which, if necessary, payments could be made at the end of the season. Consumers' prices for maize products, however, were not affected by the increase of the levy, and remained the same.

Traders' Levy.—Up to the present there has been a payment levy on purchases of maize by traders from producers in Natal and the Cape Province, with the exception of the magisterial districts of Vryburg and Mafeking. During the previous season this amounted to 8d. per bag, but it has been abolished for the season under review. The same result, however, has been obtained in another and easier manner. If a payment levy had had to be introduced, it would have had to be 1s. 7½d. per bag. As already indicated a subsidy of 3s. 1½d. per bag is payable with a view to decreasing the price to the consumer; and to obviate double payments it was decided to deduct an amount of 1s. 7½d. from the subsidy and to make a payment of only 1s. 6d. in respect of subsidies to traders.

Grain-Bag Shortage.

During the period under review, the shortage of grain bags for the maize industry made itself felt to an even greater extent than

during the previous year. Compared with the crop the available supplies were low and the greatest economy had to be practised in order to make them go as far as possible. With this end in view the Controller of Jute placed a ban on the reaping of the maize in bags and farmers were encouraged to use baskets and other containers for this purpose. At first the bags were not sold to producers but were made available to agents of the Board to be hired out to farmers against payment of a fixed fee. This scheme of compulsory hiring-out of bags, however, did not prove the success in practice that had been expected and it was therefore abolished. Moreover, it was felt that where agents were apprised of the producers' bag requirements it could be left to them to see that the available supplies of grain bags were equitably distributed. In these circumstances bags were sold to agents and they in turn could make these available to producers either by hiring, selling or in any other way deemed fit. Adequate supplies to meet their requirements were, however, not available and the major portions of the crop had, therefore, to be delivered in bulk. As is known the existing elevator system can absorb only about 750,000 bags of maize and consequently it was evident from the outset that measures would have to be taken to make provision for the storage of that portion of the maize crop, that could not be bagged. The warehouses of co-operative societies who are the chief storage agents are equipped exclusively for the storage of bagged maize and in order to meet the bag shortage they converted the warehouses as far as possible for bulk storage.

The storage capacity of the elevator system was also increased by the erection of former air-craft hangars at the existing elevators.

Kaffircorn.

Owing to drought in the principal kaffircorn-producing areas the expected kaffircorn crop of the past year was below normal, although better than that of the previous season. The crops for Europeans only is estimated at 600,000 bags in comparison with a crop of 363,000 bags for the previous season. Since the lifting, during May 1946, of price control, in respect of kaffircorn, the price increased from 20s. 6d. per bag to approximately 70s., but since then the price has steadily decreased to 30s. 5d. per bag in July 1947, rising again until in August 1947 it was approximately 32s. 7d. per bag and still showing a rising tendency. Generally speaking, the uncontrolled prices of the past year were therefore considerably higher than the prices for the previous year which were, to a large extent, controlled.

The following average annual prices for kaffircorn have been in operation since 1938/39.

Year.	Per bag of 200 lb.
	s. d.
1938/39.....	8 9
1939/40.....	16 7
1940/41.....	18 8
1941/42.....	24 11
1942/43.....	21 7
1943/44.....	18 6
1944/45.....	20 6
1945/46.....	48 9
1946/47.....	32 4*

*Average for May to August 1947.

THE PRINCIPAL AGRICULTURAL PRODUCTS.

Winter Cereals.

(a) Wheat.

Although the past crop was considerably larger than that of 1945-46, it was still much smaller than was at first expected. Again it was particularly the Orange Free State that necessitated a gradual reduction of the first estimates. The early wheat was damaged by frost in that province and later on drought caused even more damage. In certain parts hail also helped to upset the initial optimistic expectations. Nevertheless the total threshing figures until the 30 August 1947 showed a big improvement on the 1945-46 figures, as is evident from the following comparison—

Province.	BAGS OF 200 LB. NET.				
	1942/43 Season.	1943/44. Season.	1944/45 Season.	1945/46 Season.	1946/47 Season. (30/8/47.)
Cape Province.....	2,797,027	2,707,463	2,626,780	2,168,563	2,502,929
Transvaal.....	774,851	842,956	484,017	419,909	541,942
Orange Free State.	2,585,307	1,784,638	263,352	218,060	1,536,013
Natal.....	989	837	53	—	—
TOTAL FOR UNION.	6,158,174	5,335,894	3,374,202	2,806,532	4,580,884

It will be remembered that it was necessary, as a result of the critical supply position that developed during April 1946, to introduce fairly drastic measures for ensuring an uninterrupted supply of meal for bread. The circumstances have been fully explained in the previous report. The larger crop for 1946-47 and the most strident position in regard to maize made it possible for the most stringent of these conservation measures to be withdrawn and to increase the quantity of No. 1 unsifted meal (standard meal) that could be sold by millers by about 10 per cent. as from 1 January 1947. The deduction made by a large section of the public was that the Union's bread difficulties were a thing of the past. That was and is by no means the case. A crop of $4\frac{1}{2}$ million bags is not large enough to provide for the Union's requirements—not even on the basis of standard bread and meal. The Union requires a total of *at least* $6\frac{1}{2}$ million bags of wheat, so that it will still be necessary to import 2 million bags in order to allow unrestricted consumption of standard bread and meal. As a result of the critical grain position throughout the world, however, the Union could not expect the full shortfall to be allocated to it by the International Food Council. It was imperative therefore to exercise the greatest possible care.

The quantity of meal that millers could sell was therefore provisionally increased by only 10 per cent. as from 1 January 1947, which, of course, did not satisfy the full demand. It was the intention, if circumstances permitted, to increase the quantity by a further 20 per cent. during the winter months May to September, when a bigger demand for bread exists. Because of the fact that no wheat could be imported during the first half of the year and the position later on was so uncertain, this concession could not be made at all, and the quantity was left unchanged. This meant a saving of approximately 400,000 bags, that is, an extra month's

requirements. Towards the end of the report period it unfortunately became clear that the available quantity, including the wheat and flour (a little more than 100,000 bags) that could possibly still be imported, was just sufficient to see the country through until the first week in December. However, supplies have to be large enough to last until the new crop becomes available, that is until the end of December. A further cut was therefore unavoidable, and on 27 August 1947 it was announced that the quantity of meal released monthly would be decreased by about 10 per cent. as from September 1947. This will make the supplies last until the third week of December.

Fortunately the position is not quite as grave as during last season because supplementary foodstuffs such as maize and potatoes are in good supply, and moreover a considerable quantity of rye bread will be available.

The prices paid to wheat producers during the 1946-47 season are 40s. 6d. per bag for class B grade 1, and 41s. per bag for class A grade 1, with other classes and grades in proportion. The fertilizer allocation unfortunately could not yet be increased above 40 per cent. of producers' requirements. This fact has been taken into account in determining the wheat price, because the consequential lower yield per morgen does have its effect on production costs.

The Government again decided to subsidize the price of bread, so that it was not necessary for the consumer to bear the increase in the cost of production of producers, millers and bakers. The price of bread again was 6½d. per 29 ounces.

The jute bag position deteriorated to such an extent during the report period that it became necessary to provide for the packing of all meal in cotton bags. That necessitated an amendment of the meal prices because the costs were higher. However, that was done in such a way that the consumer was not placed in a worse position, provided he returned the bag. It is not clear yet what the bag position is going to be for the next season.

As far as the 1947-48 crop is concerned, it was announced in May 1947 that a price of 41s. per bag would be paid for B1 wheat, which is 6d. higher than the previous season's price. The prices for the other classes and grades are in proportion. This price provides for an increase in production costs of 1s. per bag and an inducement figure of 1s. 6d. per bag in order to ensure maximum production. The basis accepted for cost computation was used, namely that laid down by the Wheat Commission, with the necessary amendments according to official statistics. The fact that producers could obtain only 40 per cent. of their fertilizer requirements, had also again to be taken into account.

At the close of the report year it was not yet possible to state with any degree of certainty what the size of the 1947-48 crop was going to be. Sufficient wheat has been planted for a big crop, but experience has shown that it is unwise to depend upon a crop at this stage, because factors such as drought, untimely rains, hail, and plant lice, especially in the northern parts, may cause considerable damage in the last stages. The warning note sounded against excessive optimism in the previous report unfortunately proved justified, and unfortunately it is again necessary to point out that the general grain shortage in the world remains as acute as ever. The Union's total wheat requirements, even on the basis of standard bread and meal, are such that the greatest care must be exercised, even if we have an average crop.

THE PRINCIPAL AGRICULTURAL PRODUCTS.

(b) Other Winter Cereals.

The Wheat Board still controls barley, oats and rye under a war measure and in terms of this war measure producers are prohibited from delivering barley, oats and rye to any person other than the Board. The Minister fixes the grades as well as the selling and purchase prices of these cereals, in addition to grades for rye, flour, rye meal, rye bran and rye bread, crushed oats and ground oats. The Board fixes the prices for the rye products and oaten products with the approval of the Minister.

Barley.

The prices paid to producers during the 1946-47 season for barley were as follows—

Class A, grade one (six-row malting barley)...	25s. 0d. per bag of 150 lb. net.
Class B, grade one (two-row malting barley)...	24s. 0d. per bag of 150 lb. net.
Class C, grade one (feed barley).....	15s. 6d. per bag of 150 lb. net.
Class D, grade one (hull-less barley).....	30s. 0d. per bag of 200 lb. net.
(The prices for the lower grades were fixed in proportion.)	

It will be noted that the prices for all four classes show increases as against those for 1945-46. These increases were made in order to stimulate the production because the previous year's production was insufficient to satisfy the demand.

The Board's basic selling prices for the respective classes of barley were 7d. per bag higher than the above prices in the case of A, B and C, and 9d. per bag in the case of Class D (200 lb.). Of these 2d. and 3d., respectively, were the Board's commission, and 5d. and 6d. the agent's commission.

The following quantities of barley were purchased during the report year. (The quantities for 1945-46 are also given for purposes of comparison):—

Class.	1946/47	1945/46.
	(Bags).	(Bags).
Class A (150 lb.).....	113,706	73,205
Class B (150 lb.).....	14,090	15,009
Class C (150 lb.).....	50,401	179,733
Class D (200 lb.).....	64	415
TOTAL.....	178,261	268,362

The crop was thus much smaller than that of the previous year, as had been predicted in the previous report. The smaller crop was due to unfavourable weather conditions, particularly in the south-western Cape Province. From the outset the barley position was very serious, as is evident from the following figures in respect of estimated requirements—

	Bags.
Seed.....	50,000
Yeast and malt.....	21,630
Pearl-barley.....	87,500
Beer.....	214,000
TOTAL REQUIREMENTS.....	373,130

In addition to the local barley, there was still a carry-over of 71,505 bags of imported barley from the previous season. Moreover, a quantity of barley, namely 37,275 bags ordered for the 1945-46

season, only arrived in the new season. The total quantity of barley available, therefore, was 287,041 bags. This figure should be set against the total requirements of 373,130 bags (excluding feed). At the beginning of the period 59,579 bags were sold for feed, but when it became clear how serious the position was, no further barley was sold for feeding purposes. It was decided to execute the orders for seed and yeast in full and to reduce the allocations for pearl-barley and beer *pro rata*. There is a world shortage of barley and the Board did not succeed in importing further barley until 31 August. The following quantities were sold under the different headings until 31 August, 1947—

	Local.	Imported.	Total.
	(Bags).	(Bags).	(Bags).
Seed.....	25,596	—	25,596
Feed.....	1,572	58,007	59,579
Yeast and malt.....	13,926	5,902	19,828
Pearl-barley.....	39,159	13,745	52,904
Beer.....	94,694	31,096	125,790
Sundries.....	79	30	109
TOTAL.....	175,026	108,780	283,806

Oats.

The prices paid for oats to producers during the 1946-47 season were the following per bag of 150 lb.—

Class A, grade I.....	16s. 0d.
Class B, grade I.....	15s. 6d.

These prices were 2s. 11d. higher than those for 1945-46, and the same as those for 1944-45. As in the case of barley, the higher price was fixed in order to encourage bigger production. The Board's basic selling prices were 16s. 7d. and 16s. 1d., respectively, for oats sold for animal feed. The difference of 7d. per bag represents the Board's and agent's commission—2d. and 5d. per bag, respectively. For oats used for purposes other than animal feed and for seed and human consumption the prices were 18s. 1d. (A) and 17s. 7d. (B) per bag, respectively. The difference between the buying and selling prices, namely 2s. 1d. per bag, consisted of the Board's commission (2d.) and that of its agents (5d.), that is 7d., and 1s. 6d. intended to cover the balance of the loss on the carry-over from 1944-45 to 1945-46, namely £36,000. The nature of this loss has been fully explained in the previous report. It may be stated here that because of the fact that the 1946-47 crop was much smaller than estimated, it was not possible to recover the full £36,000, and that a small balance had to be carried forward to 1947-48.

The quantity of oats purchased by the Board until the 31st August, 1947, was as follows:—

	1946/47. (Bags).	1945/46. (Bags).	1944/45. (Bags).
Cape Province.....	278,368	460,503	625,689
Orange Free State.....	61,292	2,685	277,238
Transvaal.....	3,958	2,971	71,995
TOTAL.....	343,618	466,159	974,922

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The inadequacy of the crop is evident from the comparison with the two previous seasons above and the fact that the total requirements, excluding feed, were put at 872,800 bags (that is for seed and for human consumption). Again it was particularly the Orange Free State and the south-western Cape Province that had disappointed as a result of drought, frost, and hail. At the end of the 1945-46 season, however, there was a carry-over of 263,917 bags of imported oats, and a quantity ordered for the previous season still had to arrive. In view of the poor crop it was decided not to release any further oats for the feeding of animals after February, 1947, and to apply the full supply for seed and human consumption. The position was reviewed in May, 1947. It was clear then that there would be an estimated shortfall of 213,000 bags for the rest of the season, particularly in respect of oats for the manufacture of breakfast food. The demand for the latter continued unabatedly contrary to all expectations, in spite of the improvement in the maize position. It was decided to import a further 150,000 bags from the United States of America, but permission could be obtained for only 123,000 bags in that country. Of that quantity 52,261 bags have already been received. The total supplies and sales until 31 August, 1947, were as follows—

Supplies. (Bags of 150 lb. net.)

	<i>Bags.</i>
Union oats.....	343,618
Carry-over, 31st August, 1946 (imported)..	263,917
Imported oats received (in respect of 1945-46)	246,635
Imported oats received (in respect of 1946-47)	52,261
TOTAL.....	<u>906,431</u>

Sales. (Bags of 150 lb. net.)

Purpose.	Local.	Imported.	Total.
Seed.....	174,509	—	174,509
Breakfast food.....	144,502	266,828	411,330
Feed.....	14,057	290,909	305,056
Sundries.....	12	—	12
TOTAL.....	<u>333,080</u>	<u>557,827</u>	<u>890,907</u>

The imported oats that had been carried forward and that had been received earlier in the season, were sold at the same prices at which local oats were sold for the various purposes, except in the case of oats for the feeding of race horses. In the latter case the full landed price of the oats had to be paid. It was necessary to increase this price later in the season because of the increase in the price of imported oats. This increase also necessitated the price charged for imported oats for the manufacture of breakfast foods being increased from 18s. 1d. to 24s. 6d., because the Government had decided to subsidize the price in part only.

Maximum selling prices for crushed oats and ground oats were again fixed, and the Price Controller also again fixed maximum selling prices for oathay and cut oathay.

Rye.

The price paid to producers of rye during the 1946-47 season was 27s. per 200 lb. for grade one. This represents an increase of 2s. per bag as against the 1945-46 price of 25s. Rye still plays an

important part as a supplementary bread grain, and this fact has, of course to be taken into account when its price is fixed. When the primary bread cereal, i.e. wheat, is again freely available, the price of rye will again have to be determined mainly according to its feed value.

The selling price of local rye was 60s. 5d. per bag of 200 lb. This price is the weighted average of the selling price of South African rye and the price for imported Argentine rye carried over from the previous season. The selling price for imported rye was somewhat lower, namely 56s. 2d., because the quality was inferior to that of local rye. The prices for rye flour and rye meal were 99s. 10d. and 83s. 10d., respectively; the price for rye bran was 8s. and that for first-grade rye bread was 12d. minimum and 13½d. maximum per 2 lb. The trouble experienced with jute bags also had its effect on the packing of rye meal and rye flour, and these products, like wheaten meal, had to be packed in cotton bags as from July 1947. That necessitated an amendment of the prices for rye meal and rye flour because of the higher costs of cotton bags.

The Board's rye purchases until 31 August 1947, were as follows as compared with those for 1945-46 and 1944-45—

	1946/47. (Bags).	1945/46. (Bags).	1944/45. (Bags).
Cape Province.....	100,633	71,440	
Orange Free State.....	13,547	702	
Transvaal.....	1,471	981	
TOTAL.....	115,651	73,123	136,858

In addition, 88,908 bags of imported rye were carried over from the previous season and a further 87,121 bags of imported rye were received. The total quantity available, therefore, was 291,680 bags. The sales were as follows—

	Local. (Bags.)	Imported. (Bags.)	Total. (Bags.)
Milling purposes.....	112,042	175,806	287,848
Seed.....	2,582	—	2,582
Feed.....	1,000	—	1,000
Sundries.....	62	200	262
TOTAL.....	115,686	176,006	291,692

Because of the important part played by rye meal and rye bread in the present circumstances, it was necessary during the previous season to apply also to rye products the conservation measures that had been introduced. These measures were partly lifted in December, 1946, and more rye flour was released to the baking trade for confectionery. The requirements for rye bread were also provided in full.

The prospects for the 1947-48 season, as far as barley is

Prospects and Prices.

concerned, are fairly good. There are grounds for believing that the position will be better than it was during the past season and that it will be possible to provide in full the requirements for seed and yeast, while it will probably be possible to provide a bigger percentage of the requirements for pearl-barley and beer. The

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indications are that the chances are good for a record oat crop in the south-western Cape Province and that there will be sufficient for seed and breakfast food. It is expected that the rye crop will be more or less the same as for the report season.

The Government again announced in advance what the prices for barley, oats and rye were going to be for the next season. For barley and oats the prices will be the same as those fixed for the current season, while that of rye will be increased from 27s. to 27s. 6d. per bag.

Meat.*

During the period under review the supplies of slaughter stock and of meat generally either maintained their previous levels, or improved, except in the case of pigs, which declined as the result of the feed shortage last year.

The following table shows the slaughterings of livestock at all abattoirs as reflected by levy returns made to the Board:—

Period.	Cattle.	Calves.	Sheep.	Pigs.
1939.....	653,804	62,959	3,622,464	286,864*
1940.....	720,638	66,042	3,871,222	351,502*
1941.....	797,531	77,841	4,430,678	441,413*
1942.....	856,564	82,628	4,622,989	535,644*
1943.....	851,380	84,074	4,158,890	514,725*
1944.....	742,318	87,278	3,631,711	533,928*
1945.....	808,148	93,653	3,641,392	597,724
1946.....	995,052	99,820	3,482,405	499,059
1946 January to August.....	647,226	62,674	2,270,093	348,568
1947 January to August†.....	701,707	73,393	2,186,272	301,925

* Pigs: 1939 to 1944—Census Office figures.

† Tentative.

As far as the controlled areas are concerned, there was a marked improvement in the flow of cattle during the latter part of 1946, in comparison with the previous year, and the cold-store reserves which had been accumulated in the course of the season served to tide the controlled areas over the period of scarcity which lasted, generally speaking, until the end of February of this year. Thereafter supplies of cattle were again in excess of the slaughtering capacity on the Witwatersrand and at some other centres; on the whole, however, the flush season was of short duration (only from about the beginning of March to the beginning of May), while some centres, such as Durban and Port Elizabeth, were short of supplies throughout the period under review. This state of affairs led to an enforced hand-to-mouth policy at controlled centres, and no frozen reserves could be accumulated. It is expected, however, that there will be some cattle available for this purpose in the third quarter of this year, to supplement supplies during the normal scarce season during which there should be an improved flow of cattle as a result of the increased seasonal price.

Sheep and pigs continued to be scarce during the period under review, although there were some indications of improvement towards the end.

* For particulars regarding the meat scheme, see annexure report of the Director of Meat Supplies.

The following table gives details of slaughterings in controlled areas:—

Slaughterings in Controlled Areas. (Including private abattoirs).

Period.	Cattle.	Calves.	Sheep.	Pigs.
1940.....	509,236	57,090	2,426,393	259,763
1941.....	585,862	68,502	2,899,467	326,813
1942.....	638,104	74,855	3,068,919	375,999
1943.....	607,015	75,797	2,622,359	367,478
1944.....	496,622	78,559	1,967,152	372,412
1945.....	575,835	82,042	1,940,015	393,715
1946.....	739,333	82,578	1,740,375	285,494
1946 September.....	67,620	6,887	180,972	22,380
October.....	68,856	7,502	173,360	19,103
November.....	56,187	8,418	142,066	15,755
December.....	67,180	6,618	139,606	16,604
1947 January.....	51,629	6,922	92,031	16,970
February.....	55,096	5,851	128,010	16,507
March.....	68,583	6,599	169,071	20,640
April.....	66,018	7,520	130,516	22,018
May.....	60,972	8,708	104,533	22,717
June.....	58,171	8,643	86,762	20,377
July.....	72,403	8,821	115,825	22,909
August*.....	64,530	7,904	113,177	26,461

* Tentative.

Extensive droughts again affected parts of the Union, especially the western cattle and sheep-producing areas, and both the large stock and small stock populations suffered a setback as a result of losses caused by the droughts.

Lumpy skin disease spread further into Natal and the Cape Province during the year, but the effect on the supplies of slaughter stock seems to have been on the mild side. An outbreak of foot-and-mouth disease in the northern part of the Bechuanaland Protectorate in January 1947 made quarantine measures necessary, and it was only in June of this year that consignments to the Union could again be permitted.

Imports from Adjoining Territories.

After imports of cattle from adjoining territories, particularly from South-West Africa, had reached record proportions in the calendar year 1946, there was a severe reaction in arrivals from this source in the first part of 1947. The Bechuanaland Protectorate was ruled out for five months after the outbreak of foot-and-mouth disease there in January 1947, whilst South-West Africa sent appreciably less as the direct result of the serious drought experienced previously. A feature of the trade with adjoining territories recently is the almost complete disappearance of sheep imports. Particulars of cattle and sheep received in past years are shown in the following table:—

Period.	Southern Rhodesia.	Bechuanaland.	Swaziland.	Basutoland.	S.W.A.	Total.	Sheep and Goats from S.W.A.
1941.....	—	20,719	11,100	179	75,421	107,419	121,874
1942.....	12	33,744	15,737	1,156	73,209	123,858	189,417
1943.....	—	28,926	13,351	1,546	88,269	132,092	183,868
1944.....	—	24,729	7,714	504	82,246	115,193	135,240
1945.....	—	30,241	11,684	811	59,581	102,317	20,764
1946.....	—	35,146	12,918	77	103,059	151,200	3,771
1946:							
Jan. to July..	—	16,605	5,609	53	75,642	97,909	3,372
1947:							
Jan. to July*	—	17,567	6,558	363	49,246	73,754	640

* Tentative.

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Prices of Slaughter Animals.

Beef Prices.—Producers' beef prices for the 1947-48 season have been maintained at the prevailing average, though the seasonal rises have been changed somewhat. In order to stimulate the flow of beef during the off-season to a greater extent, the general seasonal increase on all grades except Grade IV has been raised to a maximum of 17s. 6d. per 100 lb. as compared with 15s. during the previous season. The general seasonal increase, in the case of Grade IV, is 12s. 6d. per 100 lb.

To offset the additional expenditure on account of the higher winter premium, the minimum producers' prices have been reduced (except at Durban, Pietermaritzburg and Pretoria) by 1s. per 100 lb. as compared with last year. In the case of Cape Town the prices have been reduced by 2s. to bring them on a par again with the prices on the Witwatersrand, the prices for offal at Cape Town having been increased by 1s. per 100 lb. carcass weight some time ago. The low-level prices at Durban and Pietermaritzburg have been raised by 1s. per 100 lb. and the seasonal increases accelerated so as to bring them into line with the Witwatersrand prices at an earlier date than during the previous year. It has also been decided that a premium of 1s. 6d. per 100 lb. above prices paid on the Witwatersrand is necessary to attract adequate supplies to Pretoria.

Over and above the general seasonal increase of 17s. 6d. per 100 lb. producers' prices at Cape Town will be increased by another 2s. At Cape Town, the peak will therefore be reached on the 23rd November 1947, as compared with the 9th November 1947 in the case of all other centres. In the case of Durban and Pietermaritzburg a peak of 19s. 6d. is reached on 9th November 1947.

The seasonal increases commenced on 15th June, with a 1s. per 100 lb. rise per week for five weeks, for all grades except Grade IV, followed by weekly increases at the rate of 6d. per week for nine weeks, and 1s. per week for the remaining eight weeks. In the case of Grade IV the seasonal increases commenced from the 15th June with 1s. per week for three weeks, followed by weekly increases of 6d. per week for 19 weeks.

Lamb, Mutton and Goatsmeat Prices.—The producers' prices for the 1947-48 season of lamb and of super, prime and Grade I mutton and Grade I goatsmeat were increased as follows: Cape Town, 1½d.; Witwatersrand, Pretoria, Durban and Pietermaritzburg, 1d.; and Port Elizabeth, East London, Kimberley and Bloemfontein, ¾d. per lb. dressed weight.

In the case of Grade II mutton and goatsmeat, the price increase to producers was ½d. per lb. at all centres except Cape Town where it was ¾d. per lb.

To ensure a more even distribution of mutton supplies, inter-centre changes in prices have been brought about. The prices at Durban and Pietermaritzburg are on an average 1½d. per lb. higher than at East London, Bloemfontein, Kimberley and Port Elizabeth, whereas the prices at Pretoria are 1d., on the Witwatersrand ¾d. and at Cape Town ½d. per lb. higher than the minimum prices.

Pork Prices.—Producer prices of Grades I and II porkers were raised by 1d. and those of sausages pigs and larders by ½d. per lb. dressed weight.

Veal Prices.—Prices of veal were left unaltered at 8d. per lb. for first grade and 6d. per lb. for second grade, dressed weight.

Rationing of Slaughterings.

The level at which slaughterings of cattle and sheep in non-controlled areas were rationed remained unchanged during the year. As a result of the shortage of pigs which developed in controlled areas, particularly of pigs for manufacturing purposes, it was decided to ration pig slaughterings by factories in non-controlled areas, in order to induce an increased flow of pigs to controlled areas. The measure is intended to be of a temporary nature only, and will be withdrawn as soon as supplies to controlled centres have improved sufficiently.

Dairy Products.**Production.**

The following are the production figures for the various dairy products for the past three years ended 31st August, 1947:—

CREAMERY BUTTER.

	1945.	1946.	1947.
	lb.	lb.	lb.
Union.....	38,948,151	33,823,947	33,542,847
South-West Africa.....	8,498,982	6,914,326	7,217,391
High Commission Territories.....	487,292	411,963	269,180
TOTAL.....	47,934,425	41,150,236	41,029,418

FACTORY CHEESE.

(Green weight less 6 per cent = Dry weight).

	1945.	1946.	1947.
	lb.	lb.	lb.
Union.....	16,479,483	14,730,531	15,198,572
South-West Africa.....	80,328	23,621	50,632
TOTAL.....	16,559,811	14,754,152	15,249,204

FARM CHEESE.

	1945.	1946.	1947.
	lb.	lb.	lb.
Union.....	262,234	265,156	196,562

FARM DAIRY BUTTER.

(Based on levy collected @ 1d. per lb.).

	1945.	1946.	1947.
	lb.	lb.	lb.
Union.....	1,904,469	1,673,200	1,602,680

CONDENSING MILK.

(Intake at factories).

	1945.	1946.	1947.
	Gallon.	Gallon.	Gallon.
Union.....	11,126,756	8,784,575	9,448,190

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Prices.

The following prices operated for the various dairy products:-

CREAMERY BUTTER.

Period.	Grade.	Wholesale per lb.	Retail per lb.
1/9/46 to 31/10/46.....	First.....	s. d. 2 1	s. d. 2 3
	Second.....	1 11	2 1
	Third.....	1 9	1 11
1/11/46 to 31/5/47.....	First.....	2 2	2 4
	Second.....	2 0	2 2
	Third.....	1 10	2 0
1/6/47 to 31/8/47.....	First.....	2 3	2 5
	Second.....	2 1	2 3
	Third.....	1 11	2 1

BUTTERFAT.

Period.	Grade.	Price per lb.	Premium per lb.
1/9/46 to 31/10/46.....	First.....	s. d. 2 1	d. 6
	Second.....	1 11	6
	Third.....	1 9	6
1/11/46 to 31/8/47.....	First.....	2 2	7d. during June and 9d. during July and August.
	Second.....	2 0	
	Third.....	1 10	

FACTORY CHEESE AND FARM CHEESE (CHEDDAR).

Period.	Grade.	Wholesale per lb.	Retail per lb.
1/9/46 to 31/8/47.....	First.....	s. d. 1 7	s. d. 1 10
	Second.....	1 6	1 9
	Third.....	1 4	1 7

CHEESE-MILK.

Period.	Per gallon.	Per lb. butterfat.	Premium per gallon.	Premium per lb. butterfat.
1/9/46 to 31/10/46.....	d. 10½	s. d. 2 5½	d. 2½	d. 6½
1/11/46 to 31/5/47.....	11½	2 7½	—	—
1/6/47 to 30/8/47.....	11½	2 7½	3	8½
1/7/47 to 31/8/47.....	11½	2 7½	3½	9½

CONDENSING MILK.

Period.	Per gallon.	Per lb. butterfat.
1/9/46 to 31/10/46.....	s. d. 1 2½	s. d. 3 3½
1/10/46 to 31/5/47.....	1 0½	2 9
During June, 1947.....	1 3½	3 6½
1/7/46 to 31/8/47.....	1 3½	3 7½

FARM DAIRY BUTTER AND FARM BUTTER.

Period.	Per lb.
	s. d.
1/9/46 to 31/5/47.....	2 6 (maximum).
1/6/47 to 31/8/47.....	2 7 (maximum).

Winter Premiums.

The funds for the payment of the winter premium on cheese-milk were obtained from a special levy imposed on factory cheese, whereas the funds for the payment of the winter premium on butterfat were obtained partly from a special levy on creamery butter and partly from money specially provided for the purpose. The special provision was in lieu of an increase in the price of butter to provide funds to pay the winter premiums.

Rationalization of the Industry.

During the year the Special Committee of the Dairy Industry Control Board appointed in December, 1943, to consider the rationalization of the manufacturing side of the dairy industry, continued with its work and presented a consolidating report which was considered by the Board and with certain decisions thereon referred back to the Committee for further investigation.

Sale Through One Channel.

The sale of creamery butter and factory cheese continued to take place through the Board, whilst the distribution of these products was done by agents appointed by the Board.

A pool is conducted in respect of the proceeds of the sale of both these commodities, the practical effect of which is that every manufacturer receives the same price for each grade of butter or cheese manufactured during the year.

Margarine.

After one factory had been producing interim margarine in limited quantities since 31 July, 1945, the manufacture of the standard product was also begun towards the middle of July 1947 by four factories already licensed for the purpose. These four factories include the one which had been producing the interim margarine. The standard margarine was offered for sale for the first time on 21 July, 1947 in the sub-economic regions of the nine controlled areas, and up to the end of the report year, margarine was supplied to the previous receivers of subsidised butter and, by mobile markets, to all consumers in the sub-economic areas who normally buy their commodities in such areas. Steps are being taken, however, to register persons entitled to margarine.

Margarine is produced at the rate of 7,000,000 lb. per annum, but as circumstances permit and as larger supplies of the necessary raw materials become available, the production will be increased to 12,000,000 lb. per annum—the figure previously published as representing the estimated fat requirements of the lower-income groups.

The world shortage of fats and oils continues, and consequently their prices remain comparatively high, with the result that the price of margarine is also high. It was decided, therefore, to subsidise the price of margarine so that it could be sold at 1s. 4d. per lb.

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It may be desirable to stress again the fact that the production and distribution of margarine are properly controlled and that the interests of dairy farmers will not be lost sight of. This assurance has already been given to the dairy industry, and once again it is confirmed.

Deciduous Fruit.

but plum production was about thirty per cent. below normal.

The peach, pear and grape crops of the past season were good, Following upon negotiations with the British Ministry of Food, arrangements were made for the resumption of partial exports to Great Britain, and approximately 50,000 cubic tons were exported in comparison with the average pre-war export of 85,000 cubic tons.

The export results were very satisfactory and enabled the Deciduous Fruit Board to pay remunerative prices to the producers.

The quantities shipped (in tons) were as follows:—

	1943/44.	1944/45.	1945/46.	1946/47.	1946/47 DISTRIBUTION.			
					U.K.	Sweden.	U.S.A.	Others.
Peaches.....	—	—	49	540	491	45	—	4
Plums.....	—	—	164	1,159	1,077	78	—	4
Pears.....	—	—	667	6,107	5,681	395	26	5
Grapes.....	—	—	660	9,112	8,440	190	461	61
TOTAL..	—	—	1,540	16,918	15,649	708	487	74

The prices charged for fruit supplied to the local markets were much the same as those of last season, the chief difference being that grapes were supplied in only one grade and pack, namely, the half-lug box, in order to render price control more effective.

The maximum retail prices fixed by the Price Controller were as follows:—

	<i>Cape Peninsula.</i>	<i>All other Markets.</i>
Peaches.....	No price fixation.	—
Plums.....	6d. per lb.	7d. per lb.
Pears.....	6½d. per lb.	7½d. per lb.
Grapes.....	4d. per lb.	5d. per lb.

The quantities of fresh fruit disposed of by the Board on the local markets were as follows:—

(a) Fresh Fruit Consumption (in tons).

	1943/44.	1944/45.	1945/46.	1946/47.
Peaches.....	1,325	918	784	889
Plums.....	1,951	1,250	444	867
Pears.....	2,126	4,367	1,929	2,606
Grapes.....	21,906	23,192	22,642	14,903
TOTAL.....	27,308	29,727	25,799	19,265

(b) Processing.

	1943/44.	1944/45.	1945/46.	1946/47.
Peaches.....	—	—	—	—
Plums.....	5,262	5,192	4,502	3,146
Pears.....	11,846	13,676	8,069	10,347
Grapes.....	24,934	19,039	18,991	19,419
TOTAL.....	42,042	37,907	31,562	32,912

The total quantities handled were, therefore, as follows:—

	1943/44.	1944/45.	1945/46.	1946/47.
Peaches.....	1,325	918	833	1,429
Plums.....	7,213	6,442	5,110	5,172
Pears.....	13,972	18,043	10,665	19,060
Grapes.....	46,840	42,231	42,293	43,434
TOTAL.....	69,350	67,634	58,901	69,095

With the return of more normal export conditions, on which the industry had been built up, it was not necessary to subsidize deciduous-fruit farmers, as was done during the preceding years.

Citrus Fruit.

The 1946-47 citrus crop was estimated at 3,278,000 cases of export quality, and of this 2,425,083 cases were exported, as compared with 2,767,629 cases exported during the previous season.

The 1947-48 crop is estimated at approximately 4,250,000 cases of export quality, and of this 1,680,517 cases of oranges, 313,514 cases of grapefruit and 2,274 cases of lemons had been exported up to 31 August, 1947. The total quantity of citrus exported to the United Kingdom and other countries up to the end of August, 1947, was 1,996,305 cases, of which 1,854,148 cases went to the United Kingdom, 51,571 cases to Sweden, 51,957 cases to Belgium, 25,629 cases to the Far East, 8,000 cases to Mauritius and 5,000 cases to Switzerland.

It is estimated that by the end of the 1947-48 season a total of just over 3,000,000 cases will have been exported.

Although the estimated crop for this season is slightly greater than that of last season and approximately 75 per cent. of the normal crop, the Citrus Board once again decided to retain 25 per cent. of the exportable crop for sale in the Union in order to ensure that local markets in the Union would receive adequate supplies. The direct loss to citrus growers as a result of retaining 25 per cent. of their exportable fruit will be approximately £200,000.

During the peak period of the navel season it became evident that local markets could not absorb all this fruit and it was consequently found necessary to increase the percentage for export for a short period.

During the 1946-47 season 5,298,006 pockets of citrus fruit were sold in the Union on behalf of citrus growers who participated in the various pools. This figure includes 1,936,230 pockets of export

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quality fruit produced by exporters. It is estimated that a total of 6,075,000 pockets of citrus will be disposed of in the Union during the 1947-48 season. Of this, the following quantities had been marketed through the Citrus Board up to 31 August, 1947:—

	First Grade. (Export quality).	Second Grade.	Total.
Oranges (pockets).....	1,517,215	1,324,975	2,842,190
Grapefruit (pockets).....	338,298	292,185	630,483
Lemons (pockets).....	122,996	72,442	195,438
TOTAL (pockets).....	1,978,509	1,689,602	3,668,111

In addition, it is estimated that a further 500,000 pockets were disposed of direct by growers who do not fall under the Board's control, and by "controlled" growers, with the permission of the Board.

Maximum producers' prices for fruit sold in the Union during the "in-season" period commencing 11 April, 1947, were fixed as follows:—

	Oranges. (per pocket).	Grapefruit. (per pocket).	Lemons. (per pocket).
	s. d.	s. d.	s. d.
First Grade—			
Extra Large.....	4 3	3 9	—
Large.....	4 0	3 3	3 6
Medium.....	3 9	3 0	3 0
Second Grade—			
Extra Large.....	3 6	3 3	—
Large.....	3 0	2 9	3 0
Medium.....	2 9	2 6	2 6
Small.....	2 3	2 0	2 0
Third Grade (Unsize).....	2 3	2 0	2 0
Undergrade.....	1 6	1 3	1 3

In respect of oranges exported to the United Kingdom, the same prices are being paid this season as last season. These prices vary according to the weight and condition of the fruit, irrespective of size.

Weight of Case.	CONDITION.						
	1.	2.	3.	4.	5.	6.	7.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
58-61 lb.....	20 9	20 0	19 3	16 6	10 3	5 0	0 9
61-65 lb.....	21 6	20 9	20 0	17 3	10 9	5 3	1 0
65-69 lb.....	22 6	21 9	20 9	18 0	11 3	5 6	1 0
69-75 lb.....	24 6	23 9	22 9	19 6	12 3	6 3	1 3

NOTE.—1st condition means not less than 98 per cent. sound fruit.

4th condition means not less than 75 per cent sound fruit.

7th condition means not less than 10 per cent. sound fruit.

It will therefore be evident that the export market is of paramount importance to the industry, both from the point of view of absorptive capacity and price realized.

Despite these comparisons, however, looked at from the point of view of the producer, the industry whole-heartedly supports the policy of the Citrus Board to maintain reasonable supplies on the local markets at reasonable prices to consumers.

The prices being paid by the British Ministry of Food for grapefruit and for lemons are also on a sliding scale similar to that for oranges as set out above, and vary in the case of grapefruit from 23s. to 16s. 3½d. for first condition fruit, according to weight of case, down to 1s. 8d. per case for seventh condition fruit, and in the case of lemons from 20s. 3d. to 12s. 9d. per case for first condition fruit, according to weight, down to 3d. per case for seventh condition fruit.

The fact that the 1947-48 citrus crop will only be about 75 per cent. of normal, may be attributed to the after-effects of the drought during the past three seasons and to the lack of adequate supplies of fertilizers. The lack of rain in the south-eastern parts of the Union may result in a very poor production in this area during the 1948-49 season.

Latest reports indicate that some 150,000 new trees have been planted during the past twelve months. Of this total 25,000 were planted to replace unproductive trees and 125,000 were planted in new orchards.

The Citrus Board is now operating under and by virtue of powers vested in it by the revised South African Citrus Scheme published under Proclamation No. 44 of 1947. This scheme is based on the Marketing Act, and all War Measures, under which the Board operated during the war years, have been repealed.

The main object of the scheme is to ensure the orderly marketing of citrus fruit both locally and overseas, and its equitable distribution throughout the Union at reasonable prices to the consumer which will give a small but steady return to the producer over a period of years, and so eliminate severe fluctuations in prices.

To achieve this object, the Board is empowered to control the distribution and sale of all citrus fruit produced in the Union, to fix the maximum producers' wholesale and retail prices of citrus fruits of the various varieties, grades and sizes, and to pool the proceeds of the sale of such fruit.

Provision is also made for the pooling of railage and selling charges in order to enable the Board to give effect to its distribution plan and meet variations in demand and supply arising out of climatic conditions or other causes beyond the control of the producer.

The policy of fixing a margin between producers' and consumers' prices ensures a reasonable profit to the distributive trade, but at the same time eliminates profiteering at the expense of the consumer and the producer.

Sub-Tropical Fruit.

The serious drought which prevailed in the eastern Cape Province during 1945/46, was responsible for extensive damage, especially in pineapple, pawpaw and banana trees. During the year under review, however, a considerable number of new plantings of these trees have been made and, provided climatic conditions remain favourable, good crops are expected from the abovementioned fruit varieties. Avocados, mangoes and grenadillas have previously not been cultivated in large quantities in that area, but at present plantings are taking place on a fairly extensive scale.

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During the past two years extensive plantings have been carried out in the Transvaal lowveld, and had it not been for the appreciable damage caused by frost in July of 1947, particularly large crops could have been expected. Considerable expansion is expected in the near future in the Crocodile River and Letaba River areas. Frost damage was considerable, especially in pawpaws, bananas and mangoes. Grenadillas were not seriously damaged and a larger crop is expected this year.

Owing to the drought, the crops were not too good in Natal. Plantings of bananas have expanded considerably.

Dried Fruits.

Production for the 1947 season was the lowest since 1941, when the crop was abnormally low.

The following table reflects the crops (in tons) for the past seven years:—

	1941.	1942.	1943.	1944.	1945.	1946.	1947.
Currants.....	678	1,178	856	1,064	1,139	1,171	1,018
Sultanas.....	3,562	4,472	4,237	3,871	3,400	2,004	1,977
Raisins.....	5,726	6,762	7,103	6,762	6,340	6,578	3,818
Apricots.....	442	349	712	854	678	145	527
Other Vine Fruits....	708	1,286	1,201	1,608	2,078	2,179	3,665
Other Tree Fruits....	1,629	4,782	4,111	4,328	3,757	3,855	3,945
TOTAL.....	12,745	18,829	18,220	18,487	17,392	15,932	14,950

This table clearly shows how, having regard to the demand for fresh fruit for preservation and export, fluctuations in fruit production can adversely affect the production of dried fruit. Several packers have already built their own drying yards and during the past season 750 tons of dried fruit, which probably would otherwise also have been sold as fresh fruit, were derived from this source.

The gradual increase in the production of speciality dried vine fruits has in the past season assumed such proportions that packers found it necessary to export some 600 tons of Thompson's stoneless raisins.

A large quantity of dried fruit has also been imported, but the exact amount cannot readily be determined owing to the lack of particulars from grocers, bazaars, and wholesale dealers. The importation of dried fruit has in any case assumed such proportions that packers have clamoured for permission to export some of the local products in order to obviate losses.

Permission was granted for the exportation of 200 tons of prunes and 200 tons of several other dried fruit varieties.

This year the Dried Fruit Board has again had full control over currants, sultanas, raisins and apricots (fresh and dried); prunes were also fully controlled for the first time and all pools showed a surplus, which establishes a new record for the prices obtained by producers.

With the exception of the controlled dried fruits mentioned above, no prices were fixed for dried fruit during the past season, with the result that the prices of the uncontrolled varieties soared. This had an unsatisfactory effect on sales, since consumers simply bought the lower grades and packers were obliged to dispose of the

higher grades oversea. Absence of control over the prices of the specialty vine fruits has also resulted in the processing of large quantities of sultanas and raisins for sale as specialty vine fruits. An attempt at curtailing these activities in the coming season will have to be considered, either by way of price fixation or by compulsory limited production.

The Board is at present engaged in collecting data on the quantities of dried fruit produced in the different areas, as well as on the corresponding qualities, with the object of determining which districts are the most suited to certain varieties and in order to be in a position to advise producers on plantings and drying methods. If practicable, these data will in course of time be elaborated in collaboration with the Western Province Fruit Research Station in order to determine the average yield per tree in the different areas.

During the time when surpluses of raisins were produced, the Board, with the assistance of the *Koöperatiewe Wynbouers Vereniging*, introduced a subsidy scheme to supply schools, hostels and welfare organisations with raisins, with the object of creating a bigger local market and giving children and the poorer classes the benefit of a product which would otherwise have had to be exported at a loss. This scheme proved so popular that for the calendar year 1946 about 848 tons of raisins were supplied under the scheme. In view of the numerous enquiries from schools and other institutions, the Board has decided, in spite of the small raisin crop, this year to set aside £5,000 out of its funds, in order to be able to supply at least 360 tons of raisins under the scheme. Here, too, however, higher prices have caused a considerable decrease in the demand.

Eggs.

The purchasing figures for the year, obtained from wholesalers and egg circles, which represent approximately 80 per cent. of the egg trade, indicate that approximately 15,816,000 dozen eggs were purchased, as against 14,428,000 dozen during the previous year. The increased production may definitely be ascribed to the larger maize production with the consequent improvement in the feed position; and also to the greater stability afforded the poultry industry by the Department's egg-purchasing scheme.

The quantity of eggs purchased during the season (July 1946 to June 1947) under the purchasing scheme, showed a decrease in comparison with that of the previous season, viz. 2,319,360 dozen as against 2,713,366 dozen, which had already been issued and sold by the end of June 1947.

The purchasing scheme for the 1947-48 season commenced in July, 1947, but at the close of the report year a considerably smaller quantity of eggs had been purchased than during the corresponding period of the previous year. This may probably be ascribed to a larger consumption of fresh eggs.

The following wholesale prices for Grade I Large eggs became operative on the dates indicated:—

Per Dozen.		Per Dozen.	
s.	d.	s.	d.
9 August, 1946.....	1 8	7 March 1947.....	3 8
25 October, 1946.....	1 11	11 April, 1947.....	3 11
29 November, 1946.....	2 3	20 June, 1947.....	3 5
13 December, 1946.....	2 7	27 June, 1947.....	3 2
20 December, 1946.....	2 9	4 July, 1947.....	2 11
17 January, 1947.....	3 1	11 July, 1947.....	2 6
7 February, 1947.....	3 5	18 July, 1947.....	2 0

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The difference in price between Grade I and Grade II and between the sizes in each grade was 2d. per dozen.

The British Ministry of Food signified its willingness in the event of there being an export surplus in the Union during the 1947 season, to take any amount up to 50,000 boxes of 30 dozen each, at a price of 23s. per 10 dozen, free on board, for Grade I Large eggs; also any amount up to 100,000 boxes under the same conditions during the 1948 season.

As regards the egg-purchasing scheme of the Department it may be pointed out that the scheme was introduced as a war measure and that all such measures will remain in force only up to 30 June 1948, when the Emergency regulations are lifted. Consideration is therefore being given to a control scheme under the Marketing Act for the egg and poultry industry.

Groundnuts.

Owing to the serious world shortage of vegetable oils which has been acutely felt in the Union, this Department has made special efforts to stimulate groundnut production. A basic price of 35s. per 100 lb. unshelled groundnuts with a grain content of 60 per cent. (or £61 per ton shelled), was fixed by the Department, and proved an excellent stimulus to interest.

Consequently, the crop increased considerably, viz. from 5,944 tons in 1946 to approximately 21,100 tons in 1947. Whereas only 799 tons were available for oil-expressing purposes during the previous year, 9,507 tons have already been delivered for this purpose up to the end of August, and a further 1,500 to 2,000 tons may still be delivered during the rest of the season.

More than 85 per cent. of the total crop was handled by co-operative organizations.

A somewhat lower price is guaranteed for the following year (i.e. 1948), namely £56 10s. for S2 shelled. Very keen interest is being displayed in this crop and the demand for seed is so great that only a portion can be supplied. In these circumstances, a crop of 15,000 tons may be predicted, on the basis of a seed supply of 4,000 bags.

In exchange for groundnuts from West Africa, 4,000 tons of nuts were supplied to the British Government for planting in Central Africa.

The high prices of and the keen interest in groundnuts have made for an increase in the price of sunflower seed too. Contracts for 21s. 6d. per bag are being concluded between farmers and oil expressers and a large crop is expected.

During the year an Advisory Committee for the Groundnut Industry was established to advise the Department on the interests of the industry.

Dried Beans.

The latest crop is estimated at 335,000 bags as against 275,000 bags during the previous year. At the beginning of the season, it was clear that, owing to favourable conditions, the dried-bean crop, especially in the eastern Transvaal, would be particularly good, and with the improvement in the general food position there was a rapid decline in prices. It was therefore decided to allow export and

during the year the Food Controller granted permits for the export of 134,000 bags. Although prices were, generally, lower than those of the previous year the sharp decline was checked.

The following table indicates the weighted average annual prices per bag for the six main types of dried beans on the Johannesburg market:—

Year.	Yellow Sugar.	Sugar.	Canadian Wonder.	Small White.	Kidney.	Kaffir.	Six Types Together.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1937.....	24 9	21 2	20 7	18 5	18 3	12 3	18 5
1938.....	27 9	24 11	23 9	21 2	25 9	14 7	22 9
1939.....	26 7	21 3	20 8	19 0	20 3	14 11	19 6
1940.....	29 8	28 8	25 9	26 2	27 8	15 2	25 2
1941.....	34 5	32 2	28 6	29 11	29 4	19 4	28 3
1942.....	42 0	34 2	31 6	25 0	24 2	25 4	29 9
1943.....	47 4	44 0	36 0	26 10	30 3	29 0	32 11
1944.....	75 5	78 7	64 9	52 11	56 3	37 11	49 10
1945.....	108 0	105 8	74 10	79 2	88 7	60 1	79 6
1946.....	91 9	82 8	64 1	59 8	66 9	46 2	60 6
1947*.....	56 3	50 11	45 3	45 1	59 1	38 9	46 5

* Average for period January to August, 1947.

Potatoes.

Except in the Transvaal lowveld, the production of potatoes was much higher in all areas during the past season than during the 1945-46 season. The total production for 1946-47 is estimated at 4,709,828 bags of 150 lb. as against 3,100,411 bags in 1945-46.

The annual sale of potatoes during the past 3 years, viz. on the eight controlled markets for 1944 and 1945, and on 9 markets, including Kimberley, for 1946 were as follows:—

1944.....	1,168,423 bags of 150 lb.
1945.....	1,471,326 bags of 150 lb.
1946.....	1,831,143 bags of 150 lb.

During the period January to July 1947, 1,204,855 bags had already been sold on the nine markets. For the corresponding period in 1946, 1,164,560 bags were marketed.

No difficulty was experienced with the sale of table potatoes during the war years, for besides the requirements of the Union's Armed Forces, thousands of prisoners of war had to be fed, and large convoys called at the Union ports for food. The Food Controller even had to place export under control in order to prevent a shortage in the Union.

At times serious potato shortages arose and it became necessary for the Price Controller to fix maximum prices for consumers and producers.

Encouraged by the high prices of the previous year and favoured by an exceptionally good growing season, potato production reached new heights. The high production accompanied by a decreased demand in comparison with the war years, brought about a severe decline in prices. As against 133,337 bags in January 1946, 194,559 bags were marketed in January of this year, and this large supply continued until April 1947 when 217,461 bags were marketed, in comparison with 170,228 bags in April 1946.

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Producers' Prices.

The following table of the average prices for grade I potatoes on the Johannesburg market since January 1938, gives an indication of the price fluctuations:—

<i>Period.</i>	<i>Price Per Bag of 150 lb.</i>
	s. d.
January, 1938.....	11 2
January, 1939.....	5 11
January, 1940.....	7 3
January, 1941.....	11 5
January, 1942.....	19 3
January, 1943.....	10 5
January, 1944.....	16 7
January, 1945.....	22 5
January, 1946.....	34 8
First week January, 1947.....	16 5
Second week January, 1947.....	13 5
Third week January, 1947.....	11 11
Fourth week January, 1947.....	9 9
Fifth week January, 1947.....	9 5

At this stage the larger markets of the Union were already heavily loaded and the prospects were very good for a record potato crop in both the Transvaal highveld and the Orange Free State. The country was therefore faced with the possibility of a complete slump on the market and the indicated way of obviating this was to endeavour to stimulate local consumption and to export the surplus.

Export Machinery and Potato Board.

The Government therefore decided to create the necessary machinery for undertaking the export, especially of orders placed by the United Kingdom. The result was the establishment, by an Emergency Regulation promulgated on 26 February 1947, of a Potato Board whose main function would be the stabilization of the price of potatoes by export. Funds are obtained by the imposition of a levy on potatoes sold on the 9 controlled markets of the Union, and these funds are appropriated for the financing of export.

The Potato Board was established on 17 March and the Maize Board agreed to assist the new Potato Board in so far as the management of the Maize Board would also attend to the administration of the Potato Board.

Sales to the United Kingdom.

Negotiations with the Ministry of Food in the United Kingdom led to the Ministry's signifying its willingness to buy 6,500 long tons of table potatoes at £9. 17s. 6d. per ton, free on board, Union ports. This price was equivalent to approximately 13s. 3d. per bag of 150 lb. free on board.

This order was assigned to the Potato Board which undertook the export. The quantity was successfully exported and farmers were paid 10s. per 150 lb. weight, free on rail, senders station. Naturally, this price was considerably in excess of the nett receipts of the Board, since the crates, packing costs, railage and fees paid to shipping agents alone, amounted to approximately 6s. 8d. per 150 lb. Eventually this loss amounted to approximately £19,000. In this connection it may be added that the potatoes arrived in the United Kingdom in an excellent condition and the result was that a very favourable impression was created there as regards the quality

of the South African product. The Potato Board hopes to maintain the success achieved in the coming season.

Export.

All export restrictions were lifted by the Director of Food Supplies and Distribution, and the Potato Board encouraged private exporters to seek markets overseas for South African potatoes. The Board succeeded in selling considerable quantities to the Victoria League, which sent a charity consignment to the United Kingdom when during the unparalleled cold winter, supplies in that country were particularly low.

From 1 March 1947 to 12 July 1947 the export of 311,641 bags of 150 lb. each was reported, and from 12 July to 31 August the Potato Board issued permits for the export of 175,354 bags to producers. This brings the total to 486,995 bags for 1947, of which approximately 40,000 bags consisted of seed potatoes.

Price Trends.

A review of the average weekly prices fetched on the Johannesburg market for grade I, II and III potatoes since 1 February 1947, clearly indicates that the prices of all three grades were comparatively low towards the end of February and during March, viz. 2s. 3d., 1s. 10d. and 1s. 5d. per bag of 37½ lb. for grades I, II and III respectively, but from the beginning of April a gradual improvement set in. Towards the middle of July prices had reached their peak, viz. 5s., 4s. 3d. and 2s. 9d. for grades I, II and III respectively, but a sudden decline again set in towards the middle and end of August. Towards the end of August the decline was particularly noticeable in respect of 2nd and 3rd grade potatoes. This phenomenon was due to the fact that at this stage there was still a considerable supply of potatoes of a poorer quality on the lands, which had to be lifted. This led to an accumulation of the lower grades on the northern markets, but within a comparatively short period the position improved. Fortunately this state of affairs did not endure, otherwise the Board would have been compelled to intervene and suspend the marketing of 3rd grade potatoes on the controlled markets for some time. The Board, however, hesitated to resort to such drastic steps unless the price of 1st grade potatoes was seriously threatened.

The following comparative prices were operative on the Johannesburg and Pretoria markets for grade I Transvaal potatoes during the years 1945-46 and 1946-47:—

Months.	1945-46.		1946-47.	
	Johannesburg.	Pretoria.	Johannesburg.	Pretoria.
	s. d.	s. d.	s. d.	s. d.
September.....	37 6	37 2	35 8	35 6
October.....	36 9	37 8	36 3	33 11
November.....	35 5	32 10	26 10	24 8
December.....	33 2	30 6	18 11	19 6
January.....	34 8	35 8	12 4	11 8
February.....	25 7	24 2	10 1	9 9
March.....	23 9	24 0	9 6	9 7
April.....	27 0	27 3	11 5	11 10
May.....	27 3	25 2	12 8	12 8
June.....	28 0	29 0	17 4	17 5
July.....	28 8	31 3	16 11	16 1
August.....	31 9	33 2	16 2	15 2

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Seed Potatoes.

Elsewhere in this report mention is made of selection experiments which are being carried out at the Riet River Settlement with a view to the cultivation of suitable seed potatoes for distribution to producers, but meanwhile considerable quantities of seed potatoes are being imported annually in order to maintain the production of potatoes. During the 1946-47 season approximately 46,000 boxes were imported; of these, small quantities arrived during November and December 1946, but the major portion arrived during January and even during February 1947. This delay which was due to strikes overseas and shipping difficulties, resulted in the seed potatoes arriving too late for planting in many areas.

The importation of seed potatoes by the Government, which was essential during the war years, will probably be discontinued next season and importation left in the hands of the trade.

This year there was also a big surplus of locally-produced certified seed potatoes. Consequently, permission was granted to the Seed Growers' Associations to export approximately 3,000 tons of seed potatoes to South America. If this practice proves successful and our seed potatoes thrive in that country, it may mean the beginning of a regular trade in seed potatoes.

Vegetables.

In general, climatic conditions were comparatively favourable and no serious set-back was experienced as a result of drought or excessive rains. During July, however, considerable damage was caused to vegetables in the lowveld by unparalleled cold weather.

Apart from a fair degree of rust in the Cape onion crop, no serious diseases occurred.

Vegetables such as peas, green beans, carrots, beetroot, tomatoes, pumpkins, cucumbers etc., were always available in a reasonable variety. In certain cases and during certain periods however, consumers' prices were very high.

The quality of the vegetables marketed was generally good. Many producers, however, apparently still fail to appreciate the importance and value of grading. Well-graded and neatly-packed products fetched reasonably good prices.

The Cape onion crop was somewhat smaller than that of the previous year; and consequently a considerable shortage of onions was experienced at one time, with the result that prices soared. For instance, the price increased from 14s. per bag in January to 26s. 9d. per bag in June.

The following table reflects the sales of seven important kinds of vegetables on eight markets for the calendar years 1943-46:—

Kind of Vegetable.	1943. (In quantities of 100 lb.)	1944. (In quantities of 100 lb.)	1945. (In quantities of 100 lb.)	1946. (In quantities of 100 lb.)
Onions.....	464,917	509,553	546,953	543,649
Sweet potatoes.....	238,431	301,688	333,524	321,772
Tomatoes.....	495,621	761,969	856,189	903,654
Green beans.....	179,313	195,523	187,397	200,686
Green peas.....	183,881	187,451	174,996	180,103
Cabbage.....	470,015	494,995	494,653	633,532
Cauliflower.....	90,776	90,493	76,241	112,509
TOTAL.....	2,122,954	2,541,672	2,669,953	2,895,905

The average prices fetched for these vegetables during the period under discussion on the Johannesburg Market are indicated in the following table.

Month.	Onions (Cape).	Sweet Potatoes.	Tomatoes NM. No. 1.	Green Beans.	Peas.	Cabbage.	Cauliflower.
	120 lb. s. d.	120 lb. s. d.	15 lb. s. d.	20 lb. s. d.	20 lb. s. d.	150 lb. s. d.	100 lb. s. d.
1946.							
September.....	25 3	20 0	3 2	6 6	5 0	4 11	9 6
October.....	28 1	24 6	4 5	5 0	3 3	5 6	15 10
November.....	—	23 10	5 2	2 11	6 5	5 7	13 4
December.....	15 2	18 11	4 8	3 9	9 0	8 9	11 10
1947.							
January.....	14 0	16 6	5 0	3 0	4 0	9 0	11 3
February.....	14 5	16 11	5 6	4 2	3 2	11 4	12 5
March.....	18 7	15 6	7 10	3 5	5 3	12 0	12 1
April.....	22 2	12 7	6 2	2 7	6 7	7 1	6 2
May.....	24 11	10 1	7 4	3 2	9 0	6 8	7 0
June.....	26 9	9 9	5 2	2 11	5 9	6 1	8 5
July.....	31 5	8 6	3 8	6 0	5 8	6 0	7 4
August.....	42 8	8 2	3 10	10 2	5 0	4 1	5 1

Viticultural Products.

Production.

THE drought of the past year severely hit wine farmers in those areas where vineyards could not be irrigated, especially where the protracted drought conditions had caused the supply of irrigation water to give in altogether, or had so reduced the supply as to make it inadequate.

There is also still a shortage of certain fertilizers for the viticultural industry, especially potash and nitrogen, and this shortage, in conjunction with the drought, was the main reason for the decreased yield during the past year, which, on the other hand, had to meet a greatly increased demand, as reflected in the following table:—

Year.	Consumption.	Production.	Excess of Consumption over Production
	Proof Gallons.	Proof Gallons.	Proof Gallons.
1943.....	5,391,733	4,959,495	432,238
1944.....	5,858,929	5,863,134	4,205
1945.....	5,882,867	5,041,371	841,496
1946.....	6,052,962	4,858,075	1,194,887
	23,186,491	20,722,075	2,468,621
Minus 1944 Surplus.....			4,205
Nett Excess of Consumption over Production.....			2,464,416

Prices.

The following prices were operative in respect of wine:—

Distilling wine.—The minimum price of distilling wine at the standard strength of 20 per cent. was fixed by the K.W.V. for the fifth successive year at £9. 10s. 6d. per leaguer for the trade. The

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surplus of distilling wine for 1947 was fixed under emergency regulations at 25 per cent. of the total yield of distilling wine, and 75 per cent. of the yield is allocated to the trade. Consequently, the producer receives £7. 2s. 10½d. per leaguer at a standard strength of 20 per cent.

Good wine.—The fixed minimum price of good wine was increased by £3 to £11 per leaguer for 1947, and the price of quality wine by £3 to £15 per leaguer. The percentage of good wine to be bought at the price of quality wine was increased by 1½ per cent. to 10 per cent. for 1947.

The K.W.V. bonuses on distilling wine suitable for redistilling to rebate brandy, amount to £1 per leaguer on A1 and 5s. per leaguer on A2 wines. A bonus of £2. 2s. 4d. per leaguer was paid on distilling wine of the 1946 wine yield, while a bonus was paid on the good wine of the 1946 yield in order to increase the minimum price to £9 per leaguer.

Distribution.

The keen demand for wine and spirits from the 1946 wine yield led to the introduction, with a view to ensuring a proportionate distribution of the available supplies, of a distilling and good wine pool, and the creation of a committee to distribute the wine yield amongst licensed wine dealers on the basis of purchases and sales over a basic period.

Export.

The following quantities of brandy and spirits were exported during the period 1943 up to and including 1946:—

	<i>Proof Gallons.</i>
1943.....	620,293
1944.....	960,710
1945.....	576,187
1946.....	602,071

These exports represent mainly the accumulated surpluses of the years before 1943, and the present shortage of wine spirits is due mainly to the increased purchases of good wine and the larger quantities of spirits used for fortification purposes since 1943, as appears from the following figures:—

	<i>Spirits used for the Fortification of Wine. (Proof Gallons.)</i>
1943.....	2,005,392
1944.....	2,116,115
1945.....	2,070,059
1946.....	2,363,404

In order to conserve sufficient spirits for the fortification of wines and the blending of brandies, the export of gin and liqueurs has been prohibited since 1946, and the export of brandy is strictly controlled. In spite of these measures to meet the needs of the South African liquor trade, the supplies of wine spirits were still so limited that recourse had to be taken to cane sugar spirits for the manufacture of gin and liqueurs. In this connection an agreement was reached with the Natal distillers to place at the disposal of the liquor trade about 700,000 proof gallons of cane sugar spirits. Consequently the supplies of gin and liqueurs are now sufficient for local consumption.

The export trade which showed an increase during the war, was maintained during the past year and the demand still exceeds the supply to such an extent that strict control had to be exercised over

export. The following quantities were exported during the past two years:—

EXPORT OF LIQUOR. (In Gallons.)
FROM 1/8/45 TO 31/7/46.—IN CASKS.

	Samples.	Dry Wines.	Sherry and Sweet Wines.	Vermouth.	Sparkling Wines.	Brandy.	Gin.	Liqueurs.
Examined.....	1,938	1,085,055	1,734,506	112,693	—	—	—	—
Approved.....	1,802	1,006,551	1,689,228	110,536	—	—	—	—
Rejected.....	136	78,504	45,278	2,157	—	—	—	—
Percentage Rejected...	7	6.56	2.3	2.0	—	—	—	—

FROM 1/8/45 TO 31/7/46.—IN BOTTLES.								
Examined.....	4,947	226,410	141,550	54,430	6,350	*498,960	71,310	34,310
Approved.....	4,188	217,375	128,143	45,452	4,665	*468,574	60,014	29,366
Rejected.....	759	49,035	15,407	8,978	1,685	30,386	11,296	4,944
Percentage Rejected...	15.14	18.4	10.88	16.49	26.45	6.09	15.84	14.12

FROM 1/8/46 TO 31/7/47.—IN CASKS.								
Examined.....	1,337	595,958	2,605,823	103,286	—	—	—	—
Approved.....	1,309	586,593	2,587,265	103,166	—	—	—	—
Rejected.....	28	9,365	18,558	120	—	—	—	—
Percentage Rejected...	2.09	1.51	.71	.12	—	—	—	—

FROM 1/8/46 TO 31/7/47.—IN BOTTLES.								
Examined.....	1,971	140,965	77,506	20,193	3,324	*371,689	368	7,732
Approved.....	1,743	121,014	67,704	17,284	2,712	*362,682	368	7,692
Rejected.....	228	19,951	9,802	2,909	612	9,007	—	40
Percentage Rejected...	11.56	14.15	12.64	14.40	18.41	2.42	—	0.51

* A portion shipped also in casks.

The export of dry wines has, therefore, decreased considerably. This is mainly due to the partial embargo imposed by the French Government on the export of South African wines into French territories in and around Africa—territories which imported large quantities of our wines, especially dry wines, during the war. The export of fortified wines, including sherry, has increased considerably,

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however, due mainly to the increased export to England, New Zealand, Canada and Scandinavian countries. The export of other types of liquor has decreased.

Evidently South African viticultural products will in future have to face keener competition from other wine-producing countries, and competition will be on a qualitative basis. In this respect the Department has already expressed its willingness to extend the existing facilities for research in order to assist the viticultural industry to maintain the industry and to improve the quality of its products.

Chicory.

During the 1946-47 crop year the following quantities of chicory were received and distributed by the Chicory Control Board:—

	lb.
Grade 1.....	6,976,608
Grade 2.....	696,561
Grade 3.....	124,834
Total Grade Chicory.....	7,798,003
Undergrade.....	23,956
TOTAL.....	<u>7,821,959</u>

This year's crop was more than 50 per cent. in excess of that of the previous year; this is due to the fact that more seed was available, namely 12,000 lb. During the war years, great difficulty was experienced in importing seed.

Since 19,000 lb. of seed has been sold this year, an even larger crop is expected for the following season. Arrangements have been made for the importation of 25,000 lb. of seed from Holland. As in the past the seed produced by the Department has yielded excellent results.

Due to the high price of tea, a strong demand still exists for chicory, but in view of the considerable increase in the local production of this commodity shortages will be appreciably reduced in the future and importation should decrease accordingly.

The price of 1st, 2nd and 3rd grade chicory root was fixed at 36s., 30s. and 25s. respectively, for the 1946-47 season.

Wool.

In consequence of an agreement between the Union and British Governments, the British Wool Commission has, from 1940 to 1946, been purchasing the South African wool clip at fixed prices on the basis of type and scoured yield. The average prices and yields were as follows:—

Season.	Average Price. (Pence per lb. Greasy Wool.)	Yield. (£. '000,000.)
	Pence.	£
1940-41.....	10.117	10.9
1941-42.....	10.288	11.0
1942-43.....	12.736	13.0
1943-44.....	13.047	13.0
1944-45.....	13.079	11.9
1945-46.....	12.085	10.6

Although the activities of the British Wool Commission were extremely successful, the war-time arrangement could not continue permanently. Consequently a conference was arranged in London in April 1945 at which an agreement was entered into between each of the three southern wool-producing Dominions on the one hand and the United Kingdom on the other. By virtue of this agreement each Dominion undertook in conjunction with the United Kingdom, to assume responsibility for the orderly disposal of its own accumulated wool stocks and for the purchase at the wool auctions, subsequently to be reinstituted, of future clips unable to find a market at the minimum prices to be fixed annually. Co-ordination of the marketing programme and of the relative minimum prices for the three Dominions would be effected through the joint organization established under the Wool Agreement. The shareholders in this Organization are the United Kingdom, Australia, New Zealand and South Africa. Three separate organizations were created in the three Commonwealths to act on behalf of the Joint Organization. In the Union the agreement was embodied in the Wool Act of 1946, which provides for the institution of the South African Wool Disposal Organization. Any eventual profits will be divided equally between the British and Union Governments, while Union legislation lays down that the amount which the Union Government may receive, together with any balance on the levy account collected from wool producers be utilized to the advantage of the wool industry.

During the previous season the total accumulated wool stocks had already decreased from 10½ million bales to 5½ million bales, and in the case of South African stocks, to 572,000 bales, which were taken over by the Joint Organization and the South African Wool Disposal Organization. These arrangements came into force in July 1946 and in September 1946 the wool auctions were recommenced. Everything went off without a hitch. During the 1946-47 season the entire clip of 660,000 bales was sold and at the same time the accumulated stocks were decreased by 237,000 bales, in consequence of the scheme for the orderly disposal of the wool. Producers were assured of a minimum price which, with a few variations, corresponded to the purchasing prices of the British Wool Commission during the previous season, the only difference being that the levy of 13 per cent. originally aimed at, could be reduced to 7½ per cent.; consequently producers should have obtained an average of 5 per cent. more. On the whole, however, the market price was better than the guaranteed minimum price.

In September of last year the prices fluctuated somewhat, but the initial prices were maintained and later increasingly exceeded. Prices for spinners' quality subsequently rose to 28 per cent. above the price level at the beginning of the season, and that level was also more or less proportionally attained by other types with the exception of Karakul wool, which was difficult to dispose of, while coarse and coloured wool was not in great demand.

Especially during the first few months, the South African Wool Disposal Organization had to act as buyer, mainly of the poorer types, such as lox and karakul wool. But the Organization had to purchase a total of only 7,130,788 lb. at approximately £254,000. Merino wool comprised 52.1 per cent. of the total weight, native wool 0.6 per cent. and karakul wool 47.3 per cent. On the other hand, the entire South African clip for the 1946-47 season amounted to 210,355,284 lb. and yielded £14,668,840. With the exception of

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karakul and native wool, the average price obtained was 17·670d. per lb. Native wool yielded an average of 11·956d. per lb. and karakul wool 6·406d. per lb.

The levy of 7½ per cent. contributed by producers with a view to contingencies arising during the course of the wool scheme, yielded £1,100,000. This amount must also cover the current expenses of the Wool Disposal Organization and the Wool Board. A portion of the levy goes to the Wool Board.

Mohair.

During the 1946-47 season the demand for mohair was good, especially for the best types. The demand for the average and poorer types was, however, less general than usual, due mainly to the drought. The unsold supplies on hand at the end of the season therefore consisted mainly of the poorer types of the summer clip.

On 30 June 1947 there were 2,048 bales of unsold supplies in stock at Union ports, of which 2,020 bales were in warehouses in Port Elizabeth. At the end of June 1946 there were 2,983 bales of unsold supplies on hand, of which 2,630 bales were in Port Elizabeth. Hence, the quantity of unsold bales on hand at the end of this season, was approximately 900 bales less than that of the previous year.

The average prices obtained were approximately the following:—

	<i>Pence per lb.</i>
Super Summer Kid's Mohair.....	60
Super Summer Young Kid's Mohair.....	30
Super Summer Firsts.....	23
Good Summer Firsts.....	20
Average Summer Firsts.....	17 to 18
Super Winter Kid's Mohair.....	49 to 50
Good Winter Mohair.....	17 to 18
Average Winter Mohair.....	16
Lox.....	10½ to 11

Hides and Skins.

At the end of 1946 the control over hides and skins in controlled areas was transferred to the Livestock and Meat Industries Control Board, and the Board immediately set about creating machinery for the grading of hides and skins and the fixation of prices on a basis of grade and weight. A grading personnel was appointed and in addition a Hides and Skins Committee was called into being to deal with these two products.

The methods of flaying and drying of hides and skins generally employed still leaves much to be desired, every possible step is being taken to impress on producers the necessity for proper treatment and preparation of their hides and skins before marketing.

At a conference arranged by the Controller of Leather during September 1946, the following maximum prices were recommended and subsequently fixed:—

Description of Hides.	Maximum Price per lb. f.o.r. Sender's Station.
Unsalted—	<i>Pence.</i>
Green hides except calf.....	5½
Salted Hides—	
Wet-salted hides, except calf.....	7
Wet-salted calf.....	12

DRIED HIDES.

Description of Hides.	Maximum Price per Pound ex Warehouse, Coastal Port.			
	Firsts.	Seconds.	Thirds.	Fourths.
(a) Dry-salted—				
(i) Under six pounds.....	17	16	15	14
(ii) Six pounds or more but not including ten pounds.....	14½	13½	12½	11½
(iii) Ten pounds or more but not including twenty pounds.....	11½	10½	9½	8½
(iv) Twenty pounds or more but not including thirty pounds.....	10½	9½	8½	7½
(v) Thirty pounds or more.....	10	9	8	7
(b) Sun-dried—				
(i) Under six pounds.....	18	17	16	15
(ii) Six pounds or more but not including ten pounds.....	15½	14½	13½	12½
(iii) Ten pounds or more but not including fifteen pounds.....	13½	12½	11½	10½
(iv) Fifteen pounds or more.....	12½	11½	10½	9½

The following are the maximum prices per lb. at which any person may sell skins to a tanner.

<i>Dried Coarse-wool Sheep Skins, except Cross-breeds.</i>		Price.
Prime, long or short.....		13½
Second.....		10½
First rejects.....		7½
Second rejects.....		4½

DRIED GOAT SKINS, EXCEPT ANGORA SKINS.

		Maximum Price ex Warehouse at the Place Indicated in Column One.					
Place.	Description.	Extra Light.	Light.	Medium.	Heavy.	1st Dam- aged.	2nd Dam- aged.
Cape Town.....	Western Province type	20	18½	17½	17½	11½	7½
Port Elizabeth..	Western Province type	20	18½	17½	17½	11½	7½
Port Elizabeth..	Dry-salted	18½	17½	16½	16½	10½	6½
East London....	Dry-salted	17½	16½	15	15	9½	5
Durban.....	Sun-dried	16½	15	13½	13½	6½	3½
Durban.....	Dry-salted	17½	16½	15	15	9½	5

The tanneries in the Union bought all the wet unsalted and wet-salted hides produced in this country. By an agreement with the tanneries it was also stipulated that 20 per cent. of the dry-salted and 60 per cent. of the sun-dried hides may be exported as well as 66½ per cent. of the goat skins.

The prices of the percentage of hides and skins which could be exported, as well as skins the export of which was not controlled by the Controller of Leather, were not fixed and they could be sold on the open market or exported at the highest prices obtainable.

This year the fixed prices were approximately 12½ per cent. higher than those of last year, whereas the open-market prices at Port Elizabeth were generally also higher. From September 1946 when the average monthly price was approximately 11.3d. per lb., dry-salted hides of 10-19 lb. showed a rising tendency until March 1947, after

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which they fell until June, once again showing a sharp upward trend until August 1947 when the average price was approximately 15·4d. per lb. The prices of long-wool merino skins which were approximately 11·6d. per lb. in September 1946 showed the same tendency, and in August 1947 they were approximately 16·8d. per lb. These price tendencies were also in evidence in the case of sun-dried hides, goat skins and angora skins. The most important skins to show a departure from this tendency were glovers. From September 1946 the price of glovers fell from approximately 10s. 11d. per skin for good healthy skins, to 5s. 10d. in March 1947, and then showed a rising tendency to 7s. 5d. in August 1947 which, however, was still approximately 3s. 6d. less per skin than during September 1946.

The export of hides and skins has increased considerably, viz. from 43 million lb. in 1945-46 to 59 million in 1946-47. The greatest increase was in the case of sun-dried hides—(8·2 million lb.); there was, however, also an important increase in merino skins, dry-salted hides and shearlings (4·3).

Tobacco.

Production.—The yield for the season 1946-47 amounted to 29,651,615 lb. in comparison with 32,594,000 lb. for the previous year. This decline of approximately 3,000,000 lb. is due to drought in certain areas and leaching of the soil by excessive rains in other regions. Under normal conditions, the yield should actually have been considerably higher, since cultivation was carried out on a much larger scale.

Consumption.—The quantity of tobacco processed by manufacturers, together with the quantity of snuff tobacco consumed in the Union, rose from 35,754,000 lb. in 1945 to 36,722,000 lb. in 1946.

Although the tobacco supplies are supplemented by duty-free imports from Rhodesia, the steadily increasing consumption has resulted in a decline in the supplies of from 28,814,000 lb. at the end of 1945 to 25,499,000 lb. at the end of 1946. The fixed import quota of 5,000,000 lb. of tobacco from Southern Rhodesia for the present year should, however, ameliorate the supply position.

Export.—With a view to developing an export market for the future, 296,000 lb. of Virginian tobacco were exported to various countries during 1946-47 as experimental consignments.

Prices of Tobacco.—Tobacco prices for 1947-48 were fixed as follows:—

The basic price of all grades of dark air-cured tobacco was increased by 1d. per lb. and the plus-percentage which is added to the basic price of leaf tobacco was increased by a further 10 per cent., viz. from 55 to 65 per cent.

This increase is mainly due to a further rise in production costs, the unfavourable relationship between the price of tobacco and that of other farm products, the prevailing shortage of tobacco and the higher processing and packing costs of tobacco co-operative societies.

As regards the 1d. per lb. increase in the basic price of dark tobacco, it must be pointed out that the supplies of this type cannot be supplemented from elsewhere, and the increase was allowed in order to encourage production in the Union.

The following are the average selling prices of leaf tobacco disposed of by Co-operative Societies during 1946-47:—

	<i>Pence per lb.</i>
Turkish tobacco.....	39·13
Flue-cured tobacco.....	32·38
Light air-cured tobacco.....	24·26
Dark air-cured tobacco.....	14·44

Tobacco Research.—During the past few years tobacco diseases have steadily increased and the occurrence of several unknown diseases has given rise to an urgent need for intensive research. The Rustenburg Agricultural Research Station was established for this purpose, but the main problem remains the lack of trained staff. In order to overcome this difficulty, however, scholarships have been offered to students desirous of concentrating on tobacco research.

III. Reinforcement Measures.

Agricultural Legislation.

The need for some amendment to the antiquated Agricultural Acts with a view to their better enforcement under the changed circumstances which have in many respects come about, has been felt for a considerable time. During the 1947 session of Parliament, three of the old Acts were either amended or superseded by new Acts.

The Orchards and Cultivated Plants Cleansing Act, 1947 (Act 26 of 1947) does not embody any new principle but is intended to supplement the old Act (Act 13 of 1925) partly by extending the scope of the Act to include field crops and partly by other measures. This act completely supersedes the old Act and improves the terms thereof in two respects. First, it extends the principle to cover not only orchards and the pests associated with orchards, but also the pests associated with field crops such as cotton, maize, tobacco, potatoes, etc. Secondly, it simplifies the administration of the terms of the Act so that the principles embodied therein are capable of easier and more effective enforcement.

The Agricultural Produce Export Amendment Act, 1947 (Act 34 of 1947) is principally intended to supplement the provisions of the Agricultural Produce Export Act, 1917 (Act 35 of 1917). In terms of the latter, agricultural produce covers such products as meat or meat products, butter, cheese, eggs or substitutes for butter and other products to which the terms of the Act can be made applicable by the Governor-General by way of a proclamation in the Government Gazette. Wine, for instance, is a product so added and the Amendment Act of 1947 chiefly relates to the export of liquor from the Union and has as its aim the placing of the exportation of liquor on a sound basis.

The export trade naturally plays an important rôle in the economy of a country and in our country, too, therefore it is essential that a watchful eye be kept on the export trade, and proper supervision and control exercised over it. In respect of liquor, exports were practically confined to wine in bulk, but war conditions gave rise to a keen demand for Union liquor, and within a short time

REINFORCEMENT MEASURES.

large quantities of wine and spirits, not only in casks, but also in bottles, were exported.

The Fertilizers, Farm Feeds, Seeds and Remedies Act, 1947 (Act 36 of 1947) supersedes the Fertilizers, Farm Foods, Seeds and pest Remedies Act, 1917 (Act 21 of 1917), which had been in force for 30 years without ever having been amended, and consequently became ineffective and unable to meet the requirements of the present day. War conditions have also exposed the flaws in the old Act and forced the Department to resort to war measures.

Apart from the fact that the Act touches up the administrative machinery, as laid down in the old Act, its principal aim is to obviate the importation and sale of fertilizers, farm foods, seeds and ineffective or adulterated remedies or remedies falsely or inaccurately described. The Act, therefore, affords greater protection to the consumer or buyer of the products concerned.

The regulation necessary for giving effect to the terms of the Act are not yet ready for publication, but it is hoped that it will be possible to enforce them early in 1948.

Research.

In view of the multiplicity and large variety of agricultural problems which have to be solved by means of research, this phase of the Department's activities takes a very important place amongst the services to be rendered to agriculture by science.

Under the present circumstances of world reconstruction the necessity for greater exertion in the field of research is thrown vividly into relief in the sphere of agriculture no less than in that of any other activity. This applies more particularly to basic research work which has to form the foundation of long-term planning.

In addition to research on the relation between soil, plants and animals, in the light of revelations emanating from research work undertaken oversea, there is a large variety of problems of a more pressing and practical nature that have to be solved by means of research work.

So, for instance, there is the gigantic problem of soil conservation which is not confined to the application of conservation measures only. The fundamental cause of soil deterioration is the problem to be investigated. The task with which we are faced, is a cardinal one—viz., the establishment of a proper relation between the maintenance and utilization of the soil. Soil fertility must be maintained at the highest possible level, not only by the application of fertilizers but also by the elimination of malpractices and the application of scientifically formulated farming systems.

Cereal-growing and veld management also still offer vast possibilities for research. Although it is not intended that our present staple products should disappear, it might be readily admitted that there is room for improvement of our existing crops. With this end in view, extensive experiments are being undertaken by the research stations and new crops are continually being tested. Larger quantities of vegetable fats are required, and the cultivation of oil-bearing seeds, other than groundnuts and soybeans, should be tested out. Circumstances have, for instance, also forced the Union to conduct

trials on the cultivation of fibre plants and the establishment in the Union of a new industry, viz. the bag industry, holds possibilities. An officer was specially sent overseas to study fibre culture.

Plant breeding under the present modern systems offers promising results and we are indeed only on the threshold of a new era in the improvement of our staple products and the development of new crops. It is accepted unreservedly that hybrid maize seed of proper composition has an enhanced yield potential and it has already been decided in consultation with the Mealie Industry Control Board to proceed with the breeding of hybrid maize seed, to be made available to the agricultural industry, with a view to increased maize production. The Board has also expressed its willingness to support, financially and otherwise, the necessary research work that is being undertaken by the Department at the Potchefstroom College of Agriculture.

Stock breeding also offers a wide scope for research work. Better stock nutrition and the determination of the nutritive values of natural grazing and established crops grown under different conditions, are two aspects urgently requiring attention. Better feeding alone is not sufficient and improvement by cross-breeding is being undertaken in an attempt to determine, by means of long-term experiments, whether it is possible to transmit the hardiness and disease resistance of one breed to another. If need be, this objective must be reached by the development of entirely new breeds better adapted to our conditions. The development of the so-called " Uys Cattle " in Natal, by private initiative, is an example of what is being aimed at. The Union is characterized by the variety of conditions in the various regions and in respect of both sheep and cattle there is a need for better types more adapted to regional conditions.

These, however, are not the only or the most important problems, as stock diseases, insect pests and plant diseases annually cause large losses and contribute to uncertainty in agriculture. Here, too, intensive research work is needed. On the economic side there exists a strong need for more knowledge with regard to the production costs of our agricultural products and their marketing and distribution. Hence, in this respect as well, research work has to be undertaken.

The whole question of research work is linked up with the greater problem of providing agriculture with a reasonable and stable income and of bringing about an enhanced food production, a problem which has developed into one of international importance.

The Department has already for a long time been considering a comprehensive scheme for organizing the research activities on a regional basis and of effecting a better classification of research activities. With this end in view and in execution of the policy of establishing more research stations in the various regions for the local investigation of the problems of the environment, land has recently been bought in the vicinity of Bethlehem for the establishment of a research station to serve the eastern portion of the Orange Free State, while the establishment of similar institutions in other parts of the Union are also envisaged. Moreover, the establishment of the Natal Agricultural Research Institute has also been accomplished during the past year, a development which is of paramount importance to Natal, since this institution will probably develop into the guiding force in the field of research in this province.

REINFORCEMENT MEASURES.

The Co-operative Movement.

The growth of the co-operative movement has during the past few years been so marked that it is considered advisable to indicate the development by means of comparative tables. In the tables given below will be found details of the number of societies, their membership, their combined financial strength and the volume of the business done by them.

TABLE 1.—*Number and Membership of all Registered Co-operative Associations at 30 June 1947, Classified according to the main functions of the Organizations.*

Type of Organization.	Number of Associations.			Member-ship.
	With limited liability.	With un-limited liability.	Total.	
Marketing organizations.....	139	13	152	128,448
Manufacturing associations.....	60	3	63	29,858
Supply associations.....	4	0	4	3,012
Service associations.....	7	0	7	562
Co-operative farms.....	2	1	3	45
Crop-insurance associations.....	3	0	3	11,777
Total agricultural associations.....	215	17	232	173,702
Trading (consumers) societies.....	144	0	144	80,451
As at 30 June, 1947.....	359	17	376	254,153
As at 30 June, 1940.....	207	35	242	131,831
As at 30 June, 1941.....	216	30	246	147,438
As at 30 June, 1942.....	232	29	261	159,352
As at 30 June, 1943.....	242	25	267	170,334
As at 30 June, 1944.....	251	23	274	197,206
As at 30 June, 1945.....	287	22	309	209,550
As at 30 June, 1946.....	322	20	342	226,763

TABLE II.—*Summarized Financial Position of all Registered Co-operative Associations at 30 June, 1946.*

	Trading (Consumers) Societies.	Agricultural Associations.	Total.
<i>Assets—</i>	£	£	£
Fixed.....	614,732	5,035,413	5,650,145
Floating.....	1,644,713	16,358,633	18,003,346
TOTAL.....	2,259,445	21,394,046	23,653,491
<i>Liabilities.—</i>			
Capital and Reserves (Net).....	1,015,575	11,460,686	12,476,261
Loans and Creditors.....	1,243,870	9,933,360	11,177,230
TOTAL.....	2,259,445	21,394,046	23,653,491

TABLE III.—*Business Turnover of all Registered Co-operative Associations.*

Year.	Agricultural Associations.				Trading (Consumers) Societies.
	Produce.	Requisites.	Services.	Total.	
	£	£	£	£	£
1938/39.....	17,481,969	1,946,008	117,814	19,545,791	1,098,834
1939/40.....	24,972,425	2,753,726	161,126	27,887,277	1,209,937
1940/41.....	27,200,063	3,017,559	170,358	30,387,980	1,429,816
1941/42.....	28,828,779	3,441,001	140,809	32,408,589	1,786,868
1942/43.....	33,893,209	3,084,175	240,475	37,217,859	2,355,826
1943/44.....	42,605,384	4,966,438	307,434	47,879,256	2,836,981
1944/45.....	43,537,449	6,644,848	225,360	50,402,788	3,275,380
1945/46.....	43,865,652	8,057,364	259,954	52,182,970	3,805,134

(These statistics include turnover of all central and federal companies.)

Summary.

The total number of co-operative organizations has increased from 342 at 30 June 1946 to 376 at 30 June 1947. This increase is made up of 12 new co-operative agricultural companies, 3 new farmers' special co-operative companies and 29 new co-operative trading societies, but 10 companies and societies were placed in liquidation, leaving a net increase of 34. Included in the 12 new co-operative agricultural companies are three which were formed by non-European farmers, while the remaining nine consist of organizations for the supply of requisites to farmers, for the marketing of livestock, general produce, citrus and milk and for the manufacture of wine and cheese. One of the farmers' special companies was formed for the supply of electric power to farmers. The 29 new co-operative trading societies are made up of 22 European societies, four non-European, two Indian and one Coloured. In most cases the promoters of the trading societies were members of existing co-operative agricultural organizations and the latter have frequently affiliated with the trading societies. These new trading societies as a whole may therefore be regarded as having been formed for the specific purpose of supplying the household needs of the farming community.

Of the figures given in the tables above the most significant are the growth in the individual membership of co-operative organizations from 131,831 at 30 June 1940 to 254,153 at 30 June 1947, and the increase in turnover of agricultural societies and companies from £19,545,791 in 1938/39 to £52,182,970 in the year 1945/46.

The Library Service.

The collection of the Central Agricultural Library comprises about 30,000 complete works and about 100,000 agricultural and scientific periodicals.

Thousands of pamphlets, periodicals and complete works are added to the library annually. During the financial year 1 Sept., 1946 to 31 August, 1947, about 500 complete works were acquired by the Central Agricultural Library and classified under the Dewey Decimal System. More than 1,000 complete works were acquired for the Division of the Department, Colleges, etc.

REINFORCEMENT MEASURES.

Apart from the annual additions of complete works, the Central Agricultural Library receives 300 periodicals as standing orders and about 400 other periodicals on an exchange basis or free of charge. At the moment the Divisions of the Department receive about 1,900 periodicals as a standing order. A record is kept by the Central Agricultural Library of all the publications received by the Department.

During the past year 5,872 complete works and 20,838 periodicals, i.e. a total of 26,710 publications were lent out. This total is 47 per cent. higher than that of 1944 (when the last inspection was carried out).

During the past year 124 new members joined, viz. 120 farmers and 4 farmers' associations and schools, bringing the membership up to 1,520—not including officers and others who pay no deposit. It should be mentioned in this connection that for several years now the lending service to farmers has been free of charge, save for a deposit of 10s. in the case of individuals and £1 in the case of associations or schools. Literature is sent to and fro post-free.

Locust Destruction.

During the year under review a successful campaign was conducted against extensive incipient hopper outbreaks of the brown locust in ten Karoo district, whilst the International Red Locust Control Service, with headquarters at Abercorn, of which the Union became a member with effect from 1 April, 1946, conducted campaigns in the known outbreak areas of this species in Northern Rhodesia and Tanganyika during the past season.

The Brown Locust.

(*Locustana pardalina* Walk.)

As forecast in the previous annual report, extensive incipient outbreaks developed in several districts in the outbreak region of this species. This took place after the first rains of the past summer in the districts of Hopetown, Hanover, De Aar, Phillipstown and Colesberg. Later in the summer season, outbreaks also developed in Middelburg (C.P.), Hofmeyr, Cradock, Graaff Reinet and Aberdeen.

Approximately ten thousand incipient hopper bands were destroyed during the season and such excellent results were obtained that no migrating concentrations of fliers could be formed. The very large measure of success attained can be ascribed mainly to the efficient intelligence system which operated and which made it possible to destroy all hopper concentrations during the early stages of development, and to the use of a quick-acting bait containing benzene hexachloride as the poisonous ingredient.

Expenditure during the season amounted to the very small sum of only about £6,500. In proportion to the amount of money spent, a relatively larger measure of success has been attained than ever before, due again to the very efficient intelligence system and the use of the new benzene hexachloride bait.

Small-scale field experiments were first conducted in Hopetown, Hanover and Aberdeen, to test the new synthetic insecticide benzene hexachloride before general use in the field. From the results so far obtained it may be stated that this insecticide is an entirely

satisfactory and most promising substitute for sodium arsenite in locust bait. It was also found that this new insecticide is compatible with sodium arsenite in baits, and the following mixture gave excellent results:—

Sodium arsenite—bran bait.....	32 lb.
Sawdust (wattle or gum).....	18 lb.
Benzene hexachloride (20 per cent. in talcum)	1½ lb.
Graphite (warning colouration).....	6 ozs.

After the conclusion of the small-scale field experiments, it was accordingly decided to commence diluting the present stocks of sodium arsenite bran bait with sawdust obtained free of charge, in order to reduce the dangers of arsenical poisoning. Benzene hexachloride was added at the same time, in order to improve the toxic action of the bait to locusts.

This new mixture is very much quicker in its action, is a better spreader than the previous Departmental bait and also has the enormous advantage of being much less poisonous to man and higher animals and is much cheaper, since sawdust is obtained free of charge. This bait was used during the latter half of the season in large field campaigns with excellent results. When the present stock of sodium arsenite bait is consumed, it is the intention to use benzene hexachloride as the only poison in locust baits, because it is non-poisonous to man and farm animals.

An experimental air-spraying campaign was conducted against brown locust adults in the districts of De Aar and Hanover. The poison sprayed was 20 per cent. and 40 per cent. benzene hexachloride solutions in diesel oil. Very promising results were obtained and it is hoped that further tests will be possible to perfect air-spraying technique and also to test oils of different viscosities.

As regards the prospects for the coming season, incipient hopper outbreaks are expected in Colesberg, Bethulie, Hofmeyr, Steynsburg, Middelburg (C.P.), Graaff Reinet, Aberdeen, Hanover, De Aar, and Hopetown during the early part of next season and probably also in Phillipstown, Jacobsdal, Cradock and Pearston later in the season. The Department is, however, optimistic that it will be possible to control effectively all incipient outbreaks and thus prevent the formation of a new swarming cycle.

The Red Locust.

(Nomadacris septemfasciata.)

Another successful preventive campaign was conducted by the International Red Locust Control Service in the Lake Rukwa outbreak area in Tanganyika territory. As already stated, the Union has become a permanent member of this international undertaking and has assumed responsibility for a contribution of 28 per cent. of the total cost incurred in preventive control of the red locust in its outbreak areas.

International conferences were held at Abercorn and Lusaka during June 1947 to deal with matters concerning the destruction of the red locust, and the Union was represented at these conferences by the Chief Locust Officer and another Entomologist. At these meetings it was disclosed that the red-locust situation is grave indeed, and this view was confirmed by subsequent reports received from

ASSISTANCE TO FARMERS.

different territories adjacent to the known outbreak areas. This serious situation appears to have arisen as a result of breeding outside the known outbreak areas by swarms which escaped from the Rukwa Valley previous to the first effective preventive campaign conducted by the International Organization during 1945-46. The whereabouts of these escaped swarms remained unknown in the meantime and only recently their progeny appeared as flying swarms, especially in the north-western portion of Tanganyika Territory, which is swampy in nature and more or less uninhabited.

It was decided at these conferences to launch extensive campaigns, employing all known means, in a determined attempt to prevent swarms again overrunning the greater part of the southern half of the continent of Africa, as happened during the previous swarming cycle which began in 1927 and ended in 1944. The Union, in co-operation with Great Britain, is launching an experimental air-spraying campaign with Anson aircraft, provided by the South African Air Force, using solutions of either benzene hexachloride or dinitro-ortho-cresol in oil. Scientific parties from the Union and from Great Britain will study the possibilities and the results of spraying adult swarms from the air. The outcome of this experimental campaign is awaited with great interest by the Department, since aerial treatment is rapidly becoming one of the standard methods of insect control operations. Air spraying will almost certainly prove to be the Union's first line of defence against possible future red-locust invasions from the north. Should the present operations not be successful, the prospects are that the Union will again have to suffer an invasion by this species from the north, in the near future. During the previous invasion which lasted from 1933 to 1944, the Union spent £2,000,000 on control operations.

The prospects for the coming season are that campaigns against incipient hopper outbreaks will have to be conducted in the Rukwa Valley and also against extensive hopper outbreaks in neighbouring areas in Tanganyika, Ruanda Urundi and possibly also in the Belgian Congo and Uganda. The necessary preparations are already being made by the International Red Locust Control Service and the International Red Locust Campaign Directorate. Equipment and materials purchased in the Union include lorries, other motor vehicles, tents, spray pumps and benzene hexachloride in the form of a wettable powder. The Union is taking an active part in all campaigns, outside as well as inside the outbreak areas.

It is hoped that this international effort at preventive control will be so successful that the Union and other participating countries will never again experience large-scale invasions by flying swarms of this species.

IV. Assistance to Farmers.

Seed-wheat and Fertilizer Loan Scheme.

Due to the inadequate wheat crop of the past season and the fact that it is only with the greatest difficulty that local production can be supplemented by importation, it was once again decided to institute a seed-wheat and fertilizer loan scheme like that of the year before, in order to enable indigent producers in the areas where

the yields were poor, to sow wheat. The object of the scheme is to encourage maximum wheat production in the Union and so minimize the quantity of wheat which would otherwise have to be imported, usually at exorbitant prices.

The facilities and conditions of the scheme are similar to those of the previous year. That this scheme proved very popular, is borne out by the fact that the scheme had to be applied again this year in 16 districts in the Transvaal, the Orange Free State, and the Cape Province. Since some areas yielded fairly good crops last season, it goes without saying that producers will not make use of the scheme on the same scale as last year.

Groundnut Loan Scheme.

In last year's report, the opinion was expressed that the world shortage of oil-bearing seeds was likely to last for another few years and in an effort to ameliorate the difficult position to which it gave rise in the Union, it was decided during September 1946 to institute another loan scheme for the 1946-47 planting season, with a view to stimulating groundnut production in the Union.

Under the scheme credit facilities were created for producers for the purchase of a maximum quantity of 12 bags of seed and a minimum quantity of 2 bags of seed, the conditions of repayment being the same as those in respect of the 1945-46 scheme.

The scheme was made operative in the following districts:—

Transvaal.—Brits, Waterberg, Potgietersrust, Pietersburg, Zoutpansberg, Letaba, Groblersdal, Middelburg, Lydenburg, Pilgrim's Rest, Barberton, Nelspruit, Pretoria, Bronkhorstspuit, Klerksdorp, Potchefstroom and Ventersdorp.

Natal.—Dundee, Helpmekaar, Newcastle, Utrecht, Vryheid, Paulpietersburg, Estcourt, Weenen, Bergville, Kliprivier, Umvoti, Inanda, Lower Tugela, Port Shepstone, Umzinto, Umlazi, Eshowe, Hlabisa, Lower Umfolozi and Mtunzini.

Orange Free State.—Bothaville, Vredefort and Kroonstad.

Elsewhere.—Vaalhartz irrigation area.

Stock Feed Loan Scheme.

The prolonged drought in the north-eastern Cape Province and the Southern Orange Free State last summer, caused serious stock losses to the farmers in those areas and the ensuing winter could only aggravate the position. Actually there were no prospects of any improvement in the position until after the winter when the first spring rains could be expected, and many farmers were faced with ruin. In an effort to help these farmers to save some of their stock, a scheme was launched whereunder credit facilities were created to enable the farmers in the stricken areas to obtain stock feed to tide them over the winter months, until, early the following summer when it was hoped that natural grazing would once again have become available.

Under the scheme, loans amounting to £200 were granted for the purchase of stock feed, mainly maize and lucerne, but not balanced rations. The loans are repayable over a period of three

ASSISTANCE TO FARMERS.

years, at a rate of interest of 4 per cent. per year. The facilities were made available to farmers in the following districts:—

Cape Province.—Kimberley, Barkly-West, Kuruman, Hay and Herbert.

Orange Free State.—Fauresmith, Luckhoff, Koffiefontein, Jacobsdal, Jagersfontein, Edenburg, Reddersburg, Boshof, Trompsburg and Philippolis.

Protein-rich Feeds.

While it was necessary during the war years to make every effort to increase the production of essential foods, such as meat, butter, milk, eggs, etc., a world shortage of proteins resulted in the Union experiencing an acute shortage of these feeds, which are so essential for the production of protective foods. In cases where feed manufacturers were able to obtain proteins, it was invariably found that competitive buying had resulted in exorbitant prices being charged, which necessarily caused the final food products to become more expensive.

Eventually protein-rich feeds were placed under international control and the Union received its allocation through the International Emergency Food Council in Washington. This resulted in canalized buying becoming necessary, and the Association of Feed Manufacturers was made responsible for the non-competitive importation of all proteins, as well as for their distribution through feed mixers. Farmers who were in the habit of compounding their own mixtures received a measure of preference in obtaining their requirements. The Department controlled the sale of protein-rich feeds, sold as such, by means of a permit system.

The production of these mixtures soon proved uneconomic. The price increase was due to the high cost of imported proteins, even though protein comprises only a small proportion of the ration, and to maintain the level of production at the ruling prices a subsidy was paid by the Department on approved balanced rations.

This subsidy was paid on mixtures produced and sold between 5 July, 1946, and the end of November, 1946. During October and November, 1946, the subsidy amounted to £2. 15s. per ton which, in fact, was 5s. on a bag of 180 lb.

It was expected last year that sufficient cake meal would be available during 1947, and the control and subsidization of these products were consequently abandoned at the end of November, 1946. Although the supply position has not yet returned to normal, a considerable improvement has set in.

Bone Meal.

In view of the fact that the supply position in respect of bone meal was maintained on a fair level during the year and that certain firms were consistently showing balances of bone meal not taken up by farmers, the permit control system was discontinued as from the end of June, 1947. It remains necessary, however, to maintain a strict price control over bone meal, and to encourage the production of this vitally important product. Judging from the data collected during the period while control was enforced, it would appear that the quantity of bone meal fed to animals is only about two-thirds of their basic requirements, according to standards laid down by the Department.

Railage Rebates.

During the past year careful consideration was given to the advisability or otherwise, of carrying into effect the recommendations of the inter-departmental committee mentioned in last year's report, in respect of the rebate on the railage on maize and maize products, fertilizers and slaughter stock to markets and other centres.

All aspects of the concessions were again reviewed and after consultation between the Departments of Finance, Transport and Agriculture, it was agreed that the rebate previously applicable in respect of maize and maize products, should remain in force, that the rebate on slaughter stock to markets and other centres should be reduced by 50 per cent. as from 1 April, 1947, and that the rebate on fertilizers should be reduced from 90 per cent. to 75 per cent.

The concessions in respect of the transport of livestock from and stock feed to drought-stricken areas, still remain in force.

For the present year, the value of these concessions to agriculture will amount to about £1½ million.

Principal Officers of the Department.

DR. C. H. NEVELING, Secretary.

MR. J. J. ADAMS, Under-Secretary.

DR. M. S. DU TOIT, Under-Secretary.

DR. F. J. VAN BILJON, Under-Secretary and Chairman of the National Marketing Council.

DR. P. J. DU TOIT, Director of Veterinary Services.

DR. J. P. VAN ZYL, Chief, Division of Chemical Services.

DR. G. v. D. W. DE KOCK, Deputy Director of Veterinary Services.

DR. H. W. TURPIN, Director, Agricultural Education and Research.

DR. J. C. ROOS, Director, Soil Conservation and Extension.

DR. F. G. ANDERSEN, Chief, Division of Horticulture.

DR. T. J. NAUDE, Chief, Division of Entomology.

DR. R. A. DYER, Chief, Division of Botany and Plant Pathology.

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DR. R. I. NEL, Director, Western Province Fruit Research Station.

MR. T. L. KRUGER, Superintendent, Government Guano Islands.

MR. REES DAVIES, Superintendent, Low Temperature Research Laboratory.

MR. N. J. EDDY, Principal Accountant.

MR. D. J. SEYMORE, Editor.

MR. S. J. KRITZINGER, Librarian.

[Divisional Reports.]

Safeguarding the Union's Livestock Industry.

**P. J. du Toit, B.A., Dr. Phil., Dr. Med. Vet., D.Sc.,
Director of Veterinary Services.**

AS in the past, this report covers the period of one year, i.e. 1 July, 1946, to 30 June, 1947, and is subdivided into (A) Research and (B) Field Work.

A. Research.

Laboratory Products.

The following table shows the number of doses of vaccines and other laboratory products issued during the year, as well as the number of smears examined and tests conducted at Onderstepoort and the Allerton Laboratory. No further supplies of vaccine were sent to the Middle East, and consequently the table reflects a considerable decrease in the amount of horsesickness vaccine issued. Once again the country was ravaged by a severe drought, which was probably largely responsible for the decrease in the issues of many of the other vaccines and stock remedies.

Number of Doses Issued, Tests Conducted and Smears Examined.

Vaccines, remedies, tests and smears.	1.7.45 to 30.6.46	1.7.46 to 30.6.47	Increase.	Decrease.
Black-quarter vaccine.....	1,182,855	998,985	—	183,870
Bluetongue vaccine.....	1,649,892	2,075,284	425,392	—
Anthrax vaccine.....	5,144,690	5,319,900	175,210	—
Paratyphoid vaccine.....	253,119	238,765	—	14,354
Fowl typhoid vaccine.....	506,412	506,410	—	2
Horsesickness vaccine.....	202,841	148,357	—	54,484
Contagious abortion vaccine.....	88,942	81,535	—	7,407
Gallsickness vaccine.....	160,120	139,049	—	21,071
Fowl-pox vaccine.....	2,010,000	1,717,300	—	292,700
Bloodpox vaccine.....	135,835	180,005	44,170	—
Lamsiekte vaccine.....	157,255	264,140	106,885	—
Tuberculin.....	39,214	23,915	—	15,299
Mallein.....	5,175	6,385	1,210	—
Nodular worm remedy.....	15,388,200	12,466,900	—	2,921,300
Tetram.....	2,922	6,760	3,838	—
Blowfly spray.....	39,901	30,990	—	8,911
CCl ₄	615	460	—	145½
<i>Tests.—</i>				
Contagious abortion.....	16,449	15,705	—	744
Dourine.....	5,213	8,297	3,084	—
Bacillary white diarrhoea.....	323,749	393,765	70,016	—
<i>Smears.—</i>				
Onderstepoort.....	104,119	101,477	—	2,642
Pietermaritzburg.....	55,305	57,853	2,548	—

Owing to an outbreak of lumpy-skin disease during October, 1946, the issue of gallsickness vaccine at Allerton had to be discontinued.

Vaccines.

The new Lamsiekte vaccine is now being issued for animals of all kinds and ages, and also to farmers in South West Africa. A

few complaints have been received to the effect that the vaccine had not afforded complete immunity, but it appears that satisfactory protection is at present being obtained.

During the year, the following amounts of vaccines were bottled:

<i>Vaccine.</i>	<i>Doses.</i>
Anthrax.....	5,540,950
Black-quarter.....	898,905
Bloedpens.....	196,625
Bluetongue.....	2,841,448
Contagious abortion.....	90,204
Fowl pox.....	152,400
Fowl typhoid.....	706,300
Gallsickness.....	142,007
Horsesickness.....	156,201
Lamsiekte.....	290,590
Paratyphoid.....	222,262
TOTAL.....	11,237,892

From this stock, a total of 10,781,740 doses were sold to the public.

Smears and Specimens.

The 101,477 smears handled at Onderstepoort during the report year totalled about 2,600 less than last year. The number of specimens amounted to 20,494, which is roughly the same as the total for last year. Farmers and the field staff of the Division have been requested to limit the number of specimens submitted to a minimum, in view of the shortage of specimen bottles and of technical staff at Onderstepoort for the examination of specimens. The examination of milk samples, for example, had to be discontinued altogether.

Research.

A few pink-toothed animals are still being kept with a view to obtaining more information on the hereditary recessive characters.

The tuberculin test was applied to a few valuable herds in the Western Cape Province, the animals proving to be free from tuberculosis.

The arrangement under which Onderstepoort officials act in co-operation with Government Veterinary Officers in the field, is enabling the former to make direct contact with the practical problems of the farmer.

Onderstepoort tuberculin has been used in a comparative test with the P.P.D. tuberculin manufactured in England, but the results have not yet been statistically analysed.

Protozoal Diseases.

Nagana.

The work being undertaken by the Nagana Research Station at Mtubatuba in connection with the control of tsetse fly and Nagana was continued during the year under review. Control consisted of applications of D.D.T., extermination of game, clearing of forest and bush, pupa and fly counts, and the treatment of cattle infected with Nagana.

During the year and since August 1946, the Mkuzi Game Reserve received 8 treatments in which D.D.T., in smoke form and applied from aircraft, was used. The treatments were applied at fortnightly intervals and were restricted mainly to the breeding places of the tsetse fly. The last treatment was completed on 7 December,

1946. The results obtained are being checked by means of the numbers of flies trapped in 356 Harris traps in use in the Mkuzi Game Reserve for the purpose of these surveys. The following monthly totals reflect the decrease in the numbers of flies trapped:—

Month.	Number of Tsetse flies.	Month.	Number of Tsetse flies.
May 1946.....	7,624	December 1946.....	21
June 1946.....	5,407	January 1947.....	14
July 1946.....	6,147	February 1947.....	15
August 1946.....	2,046 (1st D.D.T.)	March 1947.....	19
September 1946.....	403	April 1947.....	13
October 1946.....	468	May 1947.....	35
November 1946.....	62	June 1947.....	24

The promising results obtained in the Mkuzi Game Reserve show that the application of this insecticide is at the present moment by far the most effective method of controlling tsetse fly, and consequently a start has been made with the systematic application of D.D.T. in smoke form to the Enseleni Valley and the Ntambanana farms, the Umfolozi Game Reserve and adjoining Crown land, the Hluhluwe Game Reserve, the Hluhluwe, Ncemane, Ingweni, Umduna, Umsunduzi and Mhlosinga rivers, and the Morrisvale area to the north and south of the Mkuzi river east of the Mkuzi Game Reserve. In all these areas the Division's efforts are being concentrated mainly on breeding places. In broken country, where aircraft cannot be used on account of the presence of mountains and ravines, D.D.T. is being applied by means of D.D.T. smoke generators placed on the ground. The third application of D.D.T. to these areas was commenced on 13 June, 1947; a total of at least eight applications will be necessary.

During the past year the extermination of game was continued in the Umfolozi and Mkuzi Game Reserves, as well as on the adjoining Crown land. On farms, the shooting of game was organised by the farmer's associations, and in the native areas by the Department of Native Affairs.

All operations in connection with the clearing of forest and bush have been taken over by the Division of Soil Conservation and Extension, and good progress has been made in the mechanical clearance of belts around the Hluhluwe and Umfolozi Game Reserves. With a view to checking the spread of the tsetse fly, all belts are now being cleared to a width of 2 miles. For this purpose the Hluhluwe and Umfolozi Game Reserves will have to be completely surrounded by such a cleared belt. In the Magut area, where the breeding places of the tsetse fly have been located by means of pupa counts, the thickets and brushwood are also being cleared in order to make the present favourable breeding places unfavourable for natural propagation of the fly.

Pupa and fly surveys have yielded much valuable information on the spread of tsetse fly, its incidence and breeding places. In the Magut area an intensive pupa survey led to the discovery of the breeding places in the valleys on all the farms. Further pupa surveys were made in the Umfolozi, Hluhluwe, Mkuzi and Nkumu Game Reserves, and on the adjoining Crown land, native areas and farms.

By means of fly surveys it could be established that *G. pallidipes* was the tsetse fly mainly responsible for the extensive outbreaks of nagana. *G. brevipalpis* is more or less limited to the Hluhluwe Game Reserve, but has also been found in small numbers to the south in restricted areas along the Black Umfolozi River. The occurrence of this tsetse fly in the Umfolozi area is probably of a temporary nature and may be the result of the spreading of the fly

from the Hluhluwe Game Reserve along the Hluhluwe and Nyalazi rivers. In the north *G. brevipalpis* is also found at the confluence of the Pongola and Usutu rivers; this represents the southern spread of this fly along the Usutu in Portuguese territory. *G. austeni* occurs largely in the north along the Mkuzi river, east of the Mkuzi Game Reserve, but flies of this species have, however, also been trapped to the west in the Mkuzi Game Reserve and along the Hluhluwe river east of the Mkuzi Game Reserve.

Two effective remedies, phenidium chlorite and dimidium bromide, were used for the treatment of cattle infected with nagana; these were used on a fairly large scale, and up to the present the results have been satisfactory. Supplies have been issued and controlled by the various farmers' associations, which place their orders, according to requirements, with Onderstepoort.

A sound knowledge of the fly under local conditions is necessary for the effective application of control measures. In the course of research it was found that the pupa stage varied from 30 to 40 days during the summer months December, January and February, was increased to 50 days in the case of pupae formed in March, to 90 days for April pupae and 100 days from May onwards. Further data are still being collected in connection with pupae formed during the other months of the year. During D.D.T. smoke applications it was also found that 70 per cent. to 100 per cent. mortality occurred within the first 3 days in the case of all flies collected in the treated areas and allowed to feed on cattle. After careful investigation it was found that this mortality must be ascribed to the residual effect of the D.D.T. in the treated areas.

During the past year no improvement in the nagana position could be noticed. The farmers on the Hluhluwe, Mkuzi, Ntambanana and Ngotshe farms suffered severe cattle losses, as did the natives in all the native areas adjoining the Hluhluwe, Umfolozi and Mkuzi Game Reserves. In the native areas adjoining the Mkuzi Game Reserve there are indications of a slight improvement in the nagana position, probably as a result of the D.D.T. treatments carried out there. Although immediate results cannot be expected in the surrounding areas, the fly surveys already reveal a decided decrease in the tsetse fly population as a result of the present applications of D.D.T.; consequently a general improvement of the nagana position can be expected after the winter.

Anaplasmosis.

In March 1946 a second outbreak of lumpy-skin disease occurred in the gallsickness vaccine herd at Onderstepoort. As a result, the issue of this vaccine was discontinued, but in October, 1946, after the disease had run its course, the vaccine was again made available. The issue of this vaccine from the Allerton Laboratory, Pietermaritzburg, also had to be discontinued on account of an outbreak of lumpy-skin disease, but it is hoped that the Division will shortly be able to resume issue from that centre. During the past year, 103,509 doses of vaccine were issued from Onderstepoort and distributed over large areas of the Union without any casualties among the vaccinated animals.

Research.

A laboratory and efficient isolation stable were erected for the study of the intermediate hosts which are or may be responsible for the transmission of tick-borne diseases. Some months ago this research work was commenced and it is hoped that the Division will be able to gather further information in regard to these diseases.

Virus Diseases.

Horsesickness.—The demand for horsesickness vaccine showed a considerable increase. During the period 15 June to 15 December, issues totalled 148,357 doses, as compared with 98,794 doses for the preceding year. The vaccine contains the same seven virus strains as that of the previous season, but improved methods of manufacture and the use of more efficient apparatus enabled the Division to decrease the dose from 10 cc. to 5 cc.

Due to the drought, horsesickness was not particularly severe this year, except in a few districts, where the value of vaccination was indisputably proved. The loss of two vaccinated horses were reported, the first occurring in a herd in the Eastern Transvaal and the second in the Transkei where the S.A. Police lost 13 horses out of a total mortality of 20 in the entire Force, including the horse-breeding station at Kimberley. Both cases are being investigated.

Routine research on the nature of various virus strains is being continued.

Bluetongue.—A number of new and extremely virulent virus strains have been collected, mainly in the Eastern Transvaal. Research on their association with other well-known strains has been initiated, as well as attenuation by means of cultures raised on fertilized eggs with a view to future use for vaccine purposes.

The demand for vaccine was not heavy, perhaps also on account of the drought, but reports have been received of heavy losses among unvaccinated sheep in the Eastern Transvaal. During this season a new type of vaccine was issued. It is prepared in precisely the same manner as the previous vaccine, but contains three separate virus strains instead of one only. These strains have been attenuated, by means of cultures raised on eggs to the point at which they evoke practically no noticable reaction in fully susceptible sheep but nonetheless establish good immunity. A single case of natural bluetongue occurring in vaccinated sheep has been reported. It was found that a further virus strain was responsible, and this strain will be included in next year's vaccine.

Further research was carried out with a view to the complete elimination of susceptible sheep from the process of vaccine manufacture. Considerable progress has been made, and in future other methods will be made available.

It has been found that ferrets are susceptible to bluetongue infection and may even succumb to the disease. The virus is also able to multiply in another small wild rodent, the white-tailed rat (*Mistromys albicaudatus*). This animal is suspected of playing a rôle as one of the natural sources of infection.

A request from Cyprus led to the dispatch of a supply of vaccine to that island for the control of an outbreak of this disease. the authorities have reported that the results were satisfactory.

Heart-water.—Precise research was continued on the efficacy of a series of remedies. Since Uleron is practically unobtainable, it has become imperative to find a substitute. Sulphapyridine, solupyrindine and sulphamezathine may be used.

The treatment and cure of large numbers of sheep made it possible to investigate the efficacy of various virus strains for protective purposes. A mass of data was collected and the most notable results obtained in sheep are being tested out on cattle.

Up to the present, no method for the artificial culture of the virus has been devised.

Lumpy-skin Disease.—There is evidence that this disease can be comparatively easily transmitted from an infected to a susceptible animal, but only when the infected animal has contracted the disease naturally. Under experimental conditions it is extremely difficult to maintain infection in susceptible cattle. Efforts at transmitting infection to an animal which had previously exhibited symptoms of the disease, have so far been unsuccessful, even in the case of cattle which have not exhibited any symptoms but have nonetheless received an injection of presumably infectious material. Infection of the blood appears to be present only in the initial stage, i.e. before symptoms of extensive lesions have appeared. Skin lumps are infectious only for a few days after first appearing. In the absence of flying insects, infection will obviously not be transmitted from an infected to a healthy animal solely as a result of physical contact.

Up to the present only cattle have been found to be susceptible.

Fowl-pox.—A method for raising fowl and pigeon pox cultures on eggs is being utilised with a view to the manufacture of vaccine in sufficient quantities for the Union's needs. The method is simple and cheap, and the vaccine gives adequate protection against fowl pox.

Rabies.—During the past year, 56 brain samples of wild and domestic animals were submitted for examination from various parts of the Union, Bechuanaland and South-West Africa. Only 15 contained the virus of hydrophobia. Infection was established in the case of 4 head of cattle, 1 pig, 3 dogs, 1 domestic cat, 5 yellow mon-goose (*Cynictus pennicillata*) and 1 maned jackal. As in the past, the largest number of rabies cases (10) occurred in the Orange Free State.

Physical investigation.—All research on the physical characteristics of viruses came to a standstill during the absence on study-leave of the officer-in-charge.

Bacteriology.

Anthrax vaccine.—Recently, trouble was experienced in the preparation of this vaccine, but a modification of the method of preparation solved the difficulty.

Black-quarter and bloodpens vaccines.—These vaccines gave very satisfactory results.

Lamsiekte vaccine.—It has been found that the keeping qualities of this vaccine at room temperature are not very high during summer months; consequently farmers are now advised to order just enough vaccine for immediate use. The use of corn steep liquor as a culture medium yields good results on a small scale, but difficulties in connection with filtration make large-scale use impossible. The research officer responsible for the preparation of the vaccine and the conduct of experiments on lamsiekte is away on study leave which he is devoting to the investigation of problems, the solution of which should enable us to introduce many improvements. One of the subjects of his study is methods of filtration, and he has already gained valuable information. A series of experiments has been initiated with a view to improving the vaccine.

Various strains of the lamsiekte bacillus have been isolated from carrion sent in for examination, from farms infected with lamsiekte but up to the present these strains have all proved to be one of the two now being used in the preparation of the vaccine.

Experiments with both cattle and sheep are now under way, for the purpose of studying the immunity afforded by the use of this vaccine. In sheep—because it is possible to use more individual

animals—the anti-toxin production is determined after two or more injections and at various intervals; at a later stage these animals will be tested with toxin.

Contagious abortion.—In practice, this vaccine yields highly satisfactory results. The problem of immunity in cattle treated with this vaccine is now being studied. A few new outbreaks of *Trichomonas* abortion has been discovered.

Tuberculosis.—The experiments on immunity afforded by the *Vole bacillus*, have been completed. This immunity appears to be very slight and will not be of any practical value.

After many unsuccessful attempts at raising the *Vole bacillus* on the surface of liquid media, it was recently discovered that the addition of starch induces growth in the organisms. It will therefore now be possible to produce these bacilli in quantity for experimental purposes.

Poultry Division.—During the year further progress was made in the breeding of a strain of white Leghorn possessing a high degree of resistance to the various forms of cancer. Losses due to cancer now amount to no more than 11 per cent. of those suffered when the experiments were initiated in 1936. The new and greatly improved fowl-pox vaccine is now being issued to farmers on a large scale and appears to give excellent results.

A hitherto unknown disease in Muscovy ducks has been diagnosed in Durban and its environs. Losses have been very heavy. After preliminary experiments at Allerton, Pietermaritzburg, further experiments were undertaken at Onderstepoort where they are still in progress.

The most important event of the year was the inauguration of the so-called “day-old chick scheme” in which the Division is indirectly interested. Under this voluntary scheme the poultry industry has now created the machinery by means of which the quality of day-old chicks sold to farmers will be gradually and systematically improved.

Allerton Laboratory.

Contagious abortion.—The testing of routine samples was continued, and included work on samples submitted by the municipal Veterinary Officer of Durban. These samples were taken from most of the herds supplying milk to Durban.

Bacillary white diarrhoea tests.—The number of tests once again shows an increase. For some reason most poultry farmers this year delayed their tests to late in January, with the result that bookings extended to the end of July, 1947.

There was very little time available for further research on bacillary white diarrhoea, but a certain amount of work was done on the non-specific reactor and on the strains of *Pullorum* received from Canada.

At present there are 151 holders of the B.W.D. free Certificate, as compared with 129 last year. The following are the figures for the provinces:—

Natal.....	44	} Total 151
Transvaal.....	64	
Cape.....	22	
O.F.S.....	21	

The following flocks are still being tested:—

Natal.....	12	} Total 65
Transvaal.....	22	
Cape.....	17	
O.F.S.....	14	

For the first time in any egg-laying contest, all birds were this year tested for B.W.D. and fowl typhoid before being admitted to the Durban egg-laying contest. A few reactors were discovered and barred from entering.

General laboratory activities.—In all, 1073 post mortems were held on fowls, the results showing that fowl typhoid in adult birds and B.W.D. in chicks was of very common occurrence. A number of chicks received were apparently suffering from some deficiency. Some of them were given normal feed at the institution and recovered. A number of cases of the so-called "Naboomspruit disease" were diagnosed, and "Pullet disease" made its appearance. Brooder pneumonia in chicks was diagnosed in the Union for the first time. Toxoplasmosis in a hen, as well as various forms of hypertrophy, was diagnosed in post mortems. Further cases of psittacosis in pigeons have been diagnosed, as well as two outbreaks of tuberculosis in fowls at Winterton and Pietermaritzburg. *Salmonella typhimurium* infection was diagnosed in a white swan.

Up to and including October, 1946, gallsickness vaccine was supplied to farmers throughout the Union from Allerton, the presence of lumpy-skin disease preventing its distribution from Onderstepoort. In October, however, the disease made its appearance in the neighbourhood of the Allerton Laboratory, with the result that the issue of gallsickness vaccine from Allerton had to be discontinued.

Work on mastitis in cows at the Cedara College of Agriculture has been resumed.

Parasitology.

Entomological Research.

The activities of this section during the period under review consisted of a continuation of the research on the transmission of horsesickness and bluetongue, and further evidence has been found of the rôle played by *Culicoides* in the transmission of these diseases.

Considerable progress was made in the use of the new synthetic insecticides D.D.T., benzene hexachloride and others for the protection of sheep against blowfly strike.

Research on the distribution of ticks in the Union, as well as further studies of their life cycles, was continued.

This section also undertook work on the control of tsetse fly and research on the transmission of lumpy-skin disease by biting insects—work which will be actively continued in the coming summer months.

Numerous letters of an advisory nature to farmers on the subject of external parasites on domestic animals were written, and a large number of specimens of external parasites and skin infections were also examined.

Helminthological Research.

Work is in progress on the life cycle of the various types of worms, like the large-mouthed worm (*Chabertia ovina*) the bankrupt worm (*Marshallagia marshalli*) in sheep, and lung-worm (*Filaroides osleri*) in dogs.

Observations are being conducted in order to determine how and when the most effective measures can be applied. At the present time the work consists chiefly of observations designed to determine

the effect of nutrition on susceptibility to worm infestation and to determine the effect of worms on animals at different levels of nutrition.

Tests are being conducted with a view to discovering more effective worm remedies and improving existing specifics. Phenothiazine was tested out and found to be effective against wireworms and nodular worms in sheep and against ascaris worms in horses. A modification has been introduced in the preparation of Tetram and it is expected that this will render the remedy more stable without adversely affecting its efficacy. The large collection of worms in the Division, especially the unidentified specimens, is being systematically examined. A number of new species have already been discovered and will be described at a later date.

Much time is being spent in furnishing information to farmers; worm specimens collected from their domestic animals are submitted by them for identification, whereupon the Division advises them in regard to the most effective control measures.

Biochemistry.

The study on the accessibility, for animals, of the calcium and phosphorous in *Electrophos*, a calcium metaphosphate manufactured from South African rockphosphate, was continued in an experiment on sheep in collaboration with the Nutrition Section. The preliminary results are of such a nature that no definite conclusions can be drawn. Nonetheless, there are indications that sheep are better able to utilize this product than rats. A second experiment with sheep will be initiated in the near future. In another experiment with rats, the relative accessibility of the calcium and phosphorous in di-calcium phosphate, bonemeal, bone ash and tri-calcium phosphate was studied.

The experiment on the iron and copper metabolism of sheep, which was originally designed to throw light on the problem of enzootic icterus, was concluded in the course of the year. The chemical analyses in connection with this work have, however, not yet been completed. The determination of copper and iron in certain organs of healthy and diseased (enzootic icterus) sheep was continued.

Work on the nutritive value of feed suffered as a result of staff shortage, but some progress was nevertheless made. Complete chemical analyses with particular emphasis on the components of the carbohydrate complex, of various fodder-tree seeds and of natural grasses and a winter cereal at various stages of growth are either in progress, or have been completed. The digestibility and convertible energy content of two new clovers, Berseem and redclover, have been compared with that of lucerne. In collaboration with the Nutrition Section a preliminary experiment with cattle was conducted with a view to determine differences in the digestibility of the same feed gathered in a series of consecutive separate periods of 10 days duration each.

The determination of provitamine A in grasses at various times of the year was continued.

Chemical aid for the research programme of the Physiology Section occupied much of the time of the two chemists. In this connection they had, amongst other duties, to determine the presence of volatile organic acids, pH values, nitrate and nitrite in rumen contents, alkaline reserves and plasmaprotein in blood, and sodium chloride in urine.

Research on the isolation and identification of the active components of a number of poisonous plants was continued. It was found possible to isolate the toxin of the Vaaldam algae in a very pure form. The toxin rubellin was prepared in pure form from *Urginea rubella* for structural examination. Preliminary work was done on the isolation of the active components of *Urginea burkei*, *Solanum panduriforme*, *Crotalaria damarensis* and a tulip variety. The amounts of the alkaloids retrorsin and isatidin present in *Senecio bupleuroides* were determined. In an attempt to identify the icterogenic factor in "geeldikkop", the products of the action of nitrous acid on chlorophyll were isolated in pure form; this was followed by preliminary work on their properties and structure. Administering these products to sheep, however, proved that they possessed no icterogenic properties.

During the past year one chemist was fully occupied on chemical problems in connection with the manufacture of lamsiekte vaccine. After obtaining promising initial results, as mentioned elsewhere in this report, difficulty is now being experienced with a by-product of the starch industry, the so-called corn steep liquor as a cultural medium for *Cl. botulinum* types C and D. These difficulties are presumably due to variations in the composition of the liquor. Numerous attempts, in the form of experiments in which the liquor was supplemented by the addition of other material, were made to increase the production of toxins by these organisms. The work is being continued.

Routine analyses.—Although the total number of samples of feeds, waters and mineral licks analysed for farmers was not large; the fact that they were spread over the year made inordinate demands on the time of the staff. The analysis of blood and grazing samples from the Armoedsvlakte experiment also occupied the attention of the Division.

Nutrition.

The position in regard to the essential feeds was very difficult during the past year. Much time was spent on rationing protein-rich feeds and phosphates, but at the close of the report year matters were more satisfactory and most control measures have now been abolished.

Numerous complaints have been received from farmers in regard to feeding problems and it would appear that the general level of animal nutrition in the Union has been considerably raised during the past few years. Most difficulties arise through the use of musty feeds or poor quality feeds and the shortage of green feed and minerals.

The serious lack of complete information on the actual digestibility of our indigenous feeds is still keenly felt. Work on the digestibility of lucerne hay for cattle has now been undertaken, and it is hoped to extend this activity to include the other most important feeds. Work was also initiated in an attempt to determine the amount of herbage actually ingested by cattle.

A considerable amount of information was also gained on the effect of feeding on worm-infested sheep. This work is to be continued. Clear cases of bone disease were induced in horses by feeding them good rations which, however, contained no calcium carbonate. Information was also obtained on the feeding of pigs, especially in regard to the maximum of groundnut cake meal and carcass meal that can be fed to these animals in their rations without producing a too flabby bacon.

Physiology.

Digestibility studies on ruminants.—This work, which has already been in progress for several years, is being continued with sheep and, to a lesser degree, also with cattle. At the present time the following problems are receiving special attention: (a) the effect of various rations on cellulose digestion in the fore-stomach system of the animals themselves as well as in stomach contents kept in a breeding box; (b) the effect of various sugars, starches and non-protein nitrogen compounds (*inter alia* nitrate) on the digestion of fibre; (c) the effect of mineral salts on the digestion of fibre; (d) the effect of diet and state of nutrition on sensitivity to certain toxins (nitrate, Prussic acid, etc.); (e) attempts at isolating and raising yeasts from the rumen (in collaboration with other Divisions); and (f) relation between diet, worm-infestation and wool growth in sheep (in collaboration with other Divisions).

Four further progress reports have been compiled and are now ready for publication.

Bio-climatological experiment with sheep.—This experiment has been concluded and the results will be published.

The use of sex hormones on laboratory animals and Merino ewes.—This work is being continued with a view to shortening the anoestrous period and for improved lambing.

Experiments on hoven (lucerne) and geeldikkop (Tribulus) in collaboration with the Veld Reserve, Fauresmith.—An extensive study was made of the sugar and saponin content of fresh and wilted plants, and complete reports have already been prepared for publication. Further experiments will be undertaken as soon as outbreaks are reported.

Film making.—During the year the second colour-sound film was completed; the subject was *nagana*. Two other films, the one on foot-and-mouth disease and the other on gifblaar poisoning, are ready for printing and will be released shortly.

Toxicology and Veld Control.

In all, 437 plant specimens were registered for identification and for toxicological tests.

The poison-plant garden is receiving attention, and attempts are being made to bring it in order. Considerable trouble has been experienced in this garden in keeping the plants alive.

Experiments have been conducted with *Hertia pallens* (spring-bokbossie), chestnuts, *Solanum* species, ergot, *Datura* sp., and seneciosis in rats.

Further work on fungi and fungus-infested foodstuffs has been continued.

Surgery, Gynaecology, Sex Physiology and Radiology, etc.

Clinic.

Number of clinical cases examined and treated.....	919
Number of radiographs.....	206
Number of diathermy cases.....	9
Surgical operations.....	142
Number of natives, etc., treated in First-Aid Clinic.....	501
Number of mastitis tests.....	596
Number of Ascheim-Zondek tests.....	113
Number of immunisations.....	2,766

Research.

Observations on Roaring and Whistling in Horses.—This work was continued in collaboration with the Veterinary Officer of the South African Police at Kimberley. In the previous report it was pointed out that no significant difference could be established between the progeny of roarer stallions and normal stallions mated to normal mares. This conclusion is of great importance since it proves that there is no danger attached to the mating of roarers with healthy mares under South African conditions. The work will, however, have to be continued for several years in view of the necessity for mating roarer stallions with mares descended from stallions with defective wind. Several such mares are now available.

The controversy on the heredity of laryngeal paralysis was long, sharp, unconvincing and unscientific, and the results of these experiments will be very welcome, especially in European countries where the effect of roarers on horsebreeding schemes is still a point at issue among veterinarians. Under South African conditions these results will be convincing; they may lead to further research under European conditions.

Sex Physiology.—Work on the sex physiology of mares kept at stable has been continued. It appears that oestrus does occur throughout the year but abates during winter, and that mares showing oestrus during April, May, June and July did not become pregnant. Oestrus occurring during the winter months is apparently sterile.

On the farm Nooitgedacht, Ermelo, an experiment has been initiated with 600 ewes with a view to studying the anoestrous period in sheep during the late spring and early summer, as well as the value of hormones F.S.H., F.H. and L.H. during the anoestrous period.

The effect of an acid or alkaline pH during oestrus, in rabbits and sheep, on the sex of their progeny has been studied and the results fail to show any such influence.

The effect of progesterone on the period of gestation in rabbits was studied, and at the same time observations were made on the daily food intake of these animals. Progesterone did not increase the period of gestation.

Horse-improvement Scheme at Ermelo.

This scheme at Ermelo was continued, and proved to be very popular with the farming community. The service is of great value for the horsebreeding industry. Two Percheron and three Thoroughbred stallions have been kept at stud for this purpose. During the past season the percentage of pregnancies was not very satisfactory, but that must undoubtedly be ascribed to the poor condition of many of the mares as a result of the severe drought.

Kaalplaas and Onderstepoort Farms.

The work at the Kaalplaas and Onderstepoort farms continues to be very satisfactory. The beef herd is making good progress, and uniformity is rapidly being achieved. The bulls now being bred from the Melody strain should contribute still more towards uniformity; six of these will be available during the next season.

The calves bred at Kaalplaas are being used for research purposes in connection with paratyphoid, heartwater, gallsickness, tuberculosis, contagious abortion, lumpy-skin disease, etc.

SAFEGUARDING THE UNION'S LIVESTOCK INDUSTRY.

At Kaalplaas, the breeding policy consists of crossing 'Afrikander' bulls with Sussex cows. The 7/8 crossing has been reached and the cattle are well suited to the purpose for which they were bred. No supplementary winter feeding is given, but bonemeal and salt (2:1) is always available in self-feeding hoppers. The animals are culled annually, those not making the grade being sold or used for slaughter purposes.

The herd of Zulu cattle is still doing well. The animals are small but well-formed and very hardy, and are highly resistant to local diseases and tick infestation. Taking into consideration the short history of this herd at Kaalplaas, it would appear that these animals are reacting exceptionally favourably to a careful and judicious breeding policy. This may partly be attributed to the improved environment in which the herd is being built up. In-breeding with the bull Magvala has yielded excellent heifer progeny. In order to establish the Magvala characters in the herd this policy should be continued as long as this bull remains fertile. The calves of the Dingaam line, although good, must yield to those of the Magvala line.

At present there are three strains of cows: (1) the black or O line from one of the original cows; (2) the Q line from a cow sired by Dingaam from one of the original cows and (3) the variegated or B line derived from a Magvala cow. All three lines breed well and possess good conformation and fine heads; they are fertile and produce enough milk to rear their calves.

The Zulu herd originally brought here was infected with contagious abortion, but at present there are no reactors to the contagious abortion test in the herd. At Kaalplaas, 20 mares are being kept for breeding draught horses.

Small-animal Section.

The breeding of small laboratory animals is being satisfactorily continued. All the requirements of the various sections producing vaccine etc., have been met. During the year the following small animals were issued:—

White mice.....	103,331
White rats.....	714
Rabbits.....	578
Guinea pigs.....	7,666
Ferrets.....	140

Chemical Pathology.

A large number of samples (more than 3,200) sent in by farmers, the Police, and veterinarians, were chemically examined, especially with a view to determining the presence of toxins. Mortality in livestock, especially as a result of arsenic and strychnine poisoning, is of amazing frequency. Dip tests have also been undertaken on a large scale.

Extensive accurate dip tests on the effect of benzine hexachloride ("666") and D.D.T. on ectoparasites, especially ticks are in progress both in the field and at Onderstepoort, and valuable information has been obtained.

Chemical work was undertaken with a view to determining the amounts of these substances present in dips; a large number of determinations was completed. From the latter it appears that the stability of both "666" and D.D.T., in the dip formulas at present in use, is not too satisfactory. This factor has an adverse effect on efficacy and costs. It also emphasises the fact that arsenical

dipping substances cannot be eliminated. Blood analyses in connection with various disease conditions have been carried out in collaboration with other Divisions.

The chemical control of worm remedies manufactured here was regularly applied.

Morphology.

Research.

A. *Neoplastic diseases.*

- (1) *Epitheliomata* in cattle received further attention, and a detailed pathological investigation of early lesions of ophthalmic epitheliomata in Hereford cattle was undertaken. The earliest histogenesis and histopathology of this disease was exhaustively studied.
- (2) *Glioma in fowls*.—A more intensive histopathological study of brain lesions in fowls revealed all grades of lesions, from chronic extensive focal inflammatory processes around the smaller blood-vessels to lesions exhibiting all forms of of neoplasia.

In addition, careful investigation in certain cases revealed the presence of elements suspected of being exogenous to the body, apparently of the nature of parasites.

Possible parasites were also observed in a single case of mammal (equine) glioma which was available for investigation. Consequently the status of gliomata must be revised, always bearing in mind the possibility of their being the result of a specific infection.

- (3) *Sarcomatosis and tuberculosis in dogs*.—A study of pathological specimens received during the past few years pointed to an apparently increasing incidence of tuberculosis in dogs. Most of the cases originated in Johannesburg. In many of these cases, which microscopically resembled malignant growths, it proved impossible to demonstrate acid fast bacilli microscopically although the biological test (in guinea pigs) was positive.
- (4) *Therapy of precancerous skin papillomata*.—Preliminary observations were carried out on the possibility of favourably treating such lesions in animals with podophyllin. There are indications that such growths in animals may be made subject to retrogression, but it is not yet known whether permanent cures can be effected.

- B. *Enzootic icterus*.—In collaboration with the Biochemical and Virus Diseases Sections and the Fauresmith Veld Reserve, extensive field studies were initiated, as well as transmission experiments and clinical and pathological studies. The results obtained thus far point to enzootic icterus as a haemolytic jaundice with a fulminating course, caused by digestive disturbances (stasis of the gastric canal and a disturbed ecological balance of the microfauna and microflora of the fore-stomachs) following on changes in the content and/or nature of the feed of sheep formerly kept at a specific level of nutrition and metabolism.

A detailed method of treatment, which up to the present could be applied to only one case, was so successful that further research in this direction should lead to a speedy practical solution of the problem.

SAFEGUARDING THE UNION'S LIVESTOCK INDUSTRY.

- C. *Lumpy-skin disease*.—The Division was able to cope with the pathological side of both research and routine in regard to lumpy-skin disease. The existing knowledge of the pathology of the disease is extensive, especially in regard to internal lesions and after-effects (lumpy-skin disease pneumonia, trachea-stenosis). The nature of the inclusion bodies is being studied. To date, the investigation of lesions on the embryonic membrane of developing chick embryos proved disappointing, but the work is being continued on a more intensified scale.
- D. *Equine Disease*.—The attention of the Division was drawn to unknown diseases or unknown forms of diseases in equines. For the present, activities are confined to the collection and correlation of data with a view to determining the form of research ultimately to be applied. In this connection mention must, *inter alia*, be made of undiagnosed cases of unusual paralysis and paresis observed in the Fraserburg district, "Kimberley disease" and *Icterus gravis neonatorum* which in certain respects resembles the pathological picture of Muller-Barlow's disease in man or otherwise simulates acute biliary fever.
- E. *Diseases of pigs*.—Several post mortem examinations on pigs led to the realization that, as in the case of equines, various unknown or unusual conditions are occurring in pigs on an increasing scale. This demanded the Division's attention. Examples are certain types of gastro-enteritis, idiopathic fibrinous pleuritis and peritonitis, and septicaemic conditions in young pigs.
- F. *Cattle diseases*.
- (1) Icterus with interstitial hepatitis and cirrhosis in young calves in the Vryburg area was once again specifically brought to the notice of the Division.
 - (2) Paralysis of the hindquarters in domestic animals, chiefly cattle. From information gained, the number of cases show a considerable decrease on some farms and presumably, more cases occur after dry years or in areas where the animals develop osteomalacia (predisposing factor). If the animal is exposed simultaneously to a trauma and an infection, the result may be an epidural abscess followed by paralysis.
 - (3) Affection of the nasal cavity in cattle, especially in cases of carcinoma. No further cases were reported.
 - (4) *Sterility in cattle*.—The physiology and pathology of the genitalia and endocrine organs were emphasized.
 - (5) Amongst other conditions, skin affections were discovered and investigated in connection with the differential diagnoses of lumpy-skin disease, for example onchocerciasis, lesions caused by demodex, mycotic dermatitis and a surface necrosis, of which the aetiology could not be established.
- G. "*Lamkruis*".—A demyelinating disease occurring in lambs in certain coastal areas. In this connection, information was gained on copper metabolism.
- H. *Toxoplasmosis in Dogs*.—No further cases were diagnosed during the year.
- I. *A New Staining Method* has been developed for the diagnosis of rabies in which the presence of negri bodies can be established within 3 to 4 hours after application of the freezing method.
- J. *The determination of inclusion bodies* in cases of distemper in dogs and ferrets.
- K. *Trypanosomiasis lesions* in various animals (cattle, dogs cats and jackals).

L. *Seneciosis*.—Through the interest displayed by the Toxicological Section, work on seneciosis was resumed with the intention of ultimately handing over all activity in this regard to that Section. L.D. 50 determinations have been undertaken on an intensive scale.

M. *Anatomical research*.

- (1) *Anatomy of the goat*.—With a view to facilitating the identification of skeletal parts, carcasses and organs of goats as distinguished from those of sheep, for meat grading and forensic purposes, an identification list has been drawn up.
- (2) *Histology of endocrine and sex organs of old nulliparous ewes*.—This work was confined to microscopic observations. The microscopic material is in the course of preparation.

Pathological specimens submitted for examination.

Animal.	Onderstepoort.	Out-cases.	Total.
Cattle.....	85	628	713
Sheep.....	89	86	175
Equines.....	11	44	55
Goats.....	0	8	8
Pigs.....	2	48	50
Dogs.....	0	92	92
Cats.....	0	18	18
Game.....	0	16	16
Fish.....	0	1	1
Poultry.....	24	33	57
Small animals.....	35	3	38
Man.....	0	4	4
TOTAL.....	246	981	1,227

Post Mortems.

Animal.	Onderstepoort.	Out-cases.	Total.
Cattle.....	46	34	80
Sheep.....	565	17	582
Equines.....	19	4	23
Goats.....	6	3	9
Pigs.....	6	14	20
Dogs.....	0	136	136
Cats.....	0	7	7
Game.....	0	8	8
TOTAL.....	642	223	865

Number of sections made and prepared for microscopic examination.

	Paraffin-embedded.	Frozen.	Total.
1. <i>Pathology</i> .—			
(i) Staff.....	6,636	3,961	10,597
(ii) Students.....	3,556	219	3,775
2. <i>Histology</i> .—			
(i) Staff.....	2,366	287	2,653
(ii) Students.....	—	396	396
TOTAL.....	12,558	4,863	17,421

Medicine and Therapy.

Research.

Rickettsiosis in Dogs.—In the previous annual report, mention was made of the diagnosis of this infection in 18 dogs from the vicinity of Onderstepoort. That was during the period April to June, 1946. Although the area was not greatly extended, the number of diagnoses of this disease rose to 113 during the past 12 months. The large number of available cases made it possible to gain much information on this disease and to test out a series of remedies. Best results were obtained with intravenous injections of sulphamezathine. Mortality, which in 1938 was reported from the Kruger National Park to be nearly 100 per cent., has, with treatment, been reduced to approximately 10 per cent. Mortality occurring in spite of treatment could generally be explained as having been caused by complications in the form of secondary infections or organic diseases following on Rickettsiosis and other infections.

Much time was again devoted to the improvement of diagnostic methods. In some cases, improvements to existing methods proved valuable and time-saving. This was the case especially in regard to certain haematological diagnoses.

Research on the clinical, pathological and haematological changes in babesiosis and Rickettsiosis in dogs is being continued. This work also proved to be directly applicable in the case of babesiosis in horses and cattle.

On account of the unprocurability of the rotenone preparations, a large number of other remedies were tested out against the increasing incidence of demodex scab in dogs, but without notable success.

Clinic.

The number of animals examined and treated rose by about 40 per cent. during the past year. Good use was made of this material for basic research with a view to elaboration when the new medical building, which it is hoped will be completed in 1949, with the necessary facilities is ready for occupation.

The following table reflects some details of the disease conditions diagnosed:—

Medical Clinic.

Disease.	Small animals.	Large animals.
1. Diseases of digestive system.....	82	1
2. Diseases of respiratory system....	24	3
3. Diseases of the circulatory system	15	1
4. Diseases of urinary system.....	22	0
5. Diseases of the nervous system	15	0
6. Diseases of the skin.....	61	0
7. Diseases of the senses.....	9	0
8. Diseases of metabolism.....	5	0
9. Protozoal diseases.....	207	14
10. Rickettsiosis.....	133	4
11. Virus diseases.....	18	0
12. Metazoan diseases.....	112	25
13. Miscellaneous.....	41	2
GRAND TOTALS.....	724	50

For the past 4 months the out-clinic was operated by the lecturer in ambulatory clinic, who visited 68 large animals for examination and treatment.

Zootechnics.

During the year under review the Vryburg station experienced the most severe drought of its existence. The veld received only 5 inches of rain, which was very poorly distributed and had little or no effect. It was therefore imperative to dispose of all surplus cattle; more than 100 head were moved to Kaalplaas, and various groups were fed lucerne hay in the veld. This feeding of about 300 head of cattle is being continued.

The basic bionomic experiments are being continued, but staff difficulties have confined activities to the collection of experimental data. The bonemeal-dosing versus bonemeal-lick test is being continued. The last 30 oxen have been experimentally slaughtered in the Onderstepoort Meat Research Institute. There are still 96 cows in the experiment. The bonemeal-salt ratio test is also being continued; the data thus far gathered, show that in cattle-farming it is practically impossible to control bonemeal intake from troughs by controlling the amount of salt added to the bonemeal. No new experiments were initiated during the year, but the feeding of lucerne hay to the various groups in the veld is being systematically continued, and special data are being collected with a view to their practical value in developing a policy for the feeding of cattle in times of drought.

The Nooitgedacht Experiment Station (Ermelo) and the Bestersput Experiment Farm (Petrusburg) were placed under the control of this Section on 1 June.

Meat Research.

During the year 230 head of cattle, 227 sheep and goats, 37 pigs and 76 horses and mules were slaughtered for experimental purposes, for rations, media, etc.

Research work.—Staff shortages necessarily limited the research work to slaughter tests. Of the 97 head of cattle experimentally slaughtered, 84 were oxen from Armoedsvlakte experiments, that is 30 from the bonemeal-dosing versus bonemeal-lick test, 18 from the casein supplementary feeding test, 12 from the carcass analysis test and 24 from the comparative slaughter test. The remaining 13 animals were used in a special carcass analysis and dissection test on cattle of various beef quality grades, now being conducted by a M.Sc. Agric. student of the University of Pretoria, under the guidance of the Faculty of Agriculture of the University.

The 45 goats and sheep were slaughtered in the course of 2 experiments of the Division of Agricultural Research and Education, and the 28 pigs in an experiment conducted by the Nutrition Section at Onderstepoort with a view to testing out the effects of various proteins on the quality of bacon carcasses.

Slaughtering.—No fewer than 123 head of cattle were slaughtered for native meat rations. For the feeding of dogs, cats and small laboratory animals of the Institute, not only all the offal of these cattle, but also 123 sheep carcasses were used. For media or bacteriological work, 76 horses and mules were slaughtered and all their livers used.

Wool Research.

In the main, activities in this sphere adhered to the program sketched in previous reports, but certain aspects received more attention than others.

Clean-Yield.

The report of the Clean-yield Sub-committee of the National Wool Grower's Association is based mainly on the results of about 1,100 tests on clips conducted in collaboration with the British Wool Commission at Onderstepoort. The construction of a wool-testing house is still under consideration, and in the meantime a number of tests have been conducted for the South African Wool Sales Organization.

Apart from the advantages attached to clean-yield tests in the marketing of wool, it is felt from the point of view of sheep and wool improvement, that testing facilities should be available to producers to enable them to determine the scoured-wool production of these various classes, and in that way to obtain a criterion unaffected by market-price fluctuations. The existing wool-research laboratories can undertake only fleece tests for wool breeders.

In regard to wool testing, a method has been developed by which the breeder can sample his own wool. Promising results have been obtained.

Tests on Fleeces.

The wool-testing service for breeders and farmers has been continued. The service is being extended to progeny tests for a limited number of breeders, and in this work the methods developed at the Grootfontein College of Agriculture are utilized to good purpose. In the progeny tests, in which a considerable number of animals are used, it has become imperative to apply rapid methods of testing:—

- (a) *Fleece sampling*.—The regulation demanding the submission of entire fleeces is causing difficulty in cases where large numbers of fleeces are concerned. Under a system of fleece sampling tested out by three breeders, sampling is done while the fleece is on the table, the speed of handling eliminating all possibility of partiality. The test results show a similar sampling error in the case of all three of the breeders, and the degree of accuracy is regarded as satisfactory for the fleece qualities of clean-yield, length, crimp count per inch and fineness of fibre.
- (b) *Determining fleece qualities*.—The comparatively rapid method of determining fineness of fibre on the basis of the rate of air-flow through a plug of wool fibres, was further investigated. The errors are now being checked in regard to crimp and scale structure, and various models of the apparatus are being tested. Although this method gives no indication of any variation within a sample, it can with advantage be applied in conjunction with the use of the microscope.
- (c) *Depth of Crimp*.—Depth of crimp not only plays a rôle in the manufacturing process, but also affects the ratio of straight fibre length to staple length. A method has been developed for determining the average crimp depth of wool staple, and the possibility of determining the straight length by means of the staple length and depth of crimp, is now being investigated.

The Characteristics of South African Merino Wool.

Studies on the characteristics of South African Merino Wool were continued.

The importance of crimp in wool is borne out by the considerable effect of crimp on the compressibility of wool. A study has been

initiated on the relation between crimp—both as regards crimp count and depth of crimp—and fineness of fibre, rate of growth, fibre elasticity, flexibility and sectional form of wool.

The investigation also extends to the influence of various fibre characteristics such as crimp, fineness, variation, rate of growth, sectional form and elasticity on the quality and feel of wool as judged by the practical sheep and wool expert.

Histological Studies.

Progress was made with the study of the skin of merino sheep. The purpose of this investigation is to determine what relationship, if any, there exists between follicle density and the characteristics of wool fibres.

“ Effect of Age ” Experiment.

Progress was made in the analysis of the material derived from this experiment. Body weight and body measurements were correlated and the fleece density determinations completed. Fibre thickness and fibre length are now being determined. The results are expected to throw light on the problem of the age at which the Merino can be judged for breeding purposes.

Influence of Internal Parasites.

The wool-research laboratory is collaborating with other Sections at Onderstepoort in an experiment designed to determine the influence of internal parasites on the Merino sheep and its fleece. Even at this stage the adverse effect is becoming clearly visible in a noticeable decrease in fibre thickness.

Wool-Chemistry Research.

New wool-washeries are now being established in the Union, and several others are envisaged. For competition with overseas enterprises, it is imperative for these wool-washeries to utilize the latest developments and to operate on a sound chemical basis. In addition, the by-products must also be reclaimed. During the past few years the laboratory was consulted on various occasions, and its services were highly appreciated.

A large number of problems of a biological nature are awaiting immediate investigation, only the shortage of trained staff delaying the work.

Research in these spheres shows progress in the following directions:—

1. (a) A rapid method for determining the yolk content of wool and scouring liquors has been investigated; the first portion of this work has been completed.
(b) Deodorising of the yolk.
(c) Decolouring the yolk.
(d) Splitting the yolk into its secondary constituents, as required by the trade.
2. Testing of blankets and other textiles.

Standardisation.

The wool-research laboratory maintained close collaboration with the South African Bureau of Standards, and is represented on two of the Bureau's Committees dealing with wool. In this connection a large number of fibre-fineness determinations were made; a microscopic method for determining the relative amounts of various kinds of animal fibres in a mixture has also been developed.

The rate at which various wool textiles condition themselves has also been investigated.

Although tests on textiles are being conducted by the Bureau, a limited number of tests for state departments was conducted at Onderstepoort.

General.

The wool-research laboratory at Onderstepoort also maintains a close collaboration with the Sheep and Wool Research Laboratory at the Grootfontein College of Agriculture. Reciprocal visits by the staffs of the Institutions are proving very fruitful.

By means of the wool-testing service and attendance at congresses members of the staff maintained contact with breeders and farmers.

The financial assistance afforded by the South African Wool Council is gratefully acknowledged.

Statistics.

Research.

(a) Research on the statistical analysis of time series was continued. Further work on sequential variance shows that it can be regarded as a generalization of Prof. von Neuman's (Institute for Advanced Study, Princeton) "Mean Square Successive Difference". For this reason it was decided to name this branch of statistics "Mean Square Leading Difference". This work was favourably received at Princeton.

(b) In continuation of previous work, the newest publications on the methods of solving simultaneous equations were studied, with the result that this Division now has a very rapid and accurate form of methodics at its disposal.

(c) A theoretical and practical study has also been made of the technique applied in time series and known as the "Variate Difference" method. It has been found that in practice this process does not constitute an improvement on the method of Orthogonal Polynomials as described by Van der Reyden in the Onderstepoort Journal.

(d) A study of the Theory of Sequential Tests, as developed by war scientists in America and England, has been initiated. More results and literature are being awaited, but it is hoped that our own research will be brought into line with oversea work.

B. Field Work.

This report covers the period 1 July 1946 to 30 June 1947.

Lumpy Skin Disease.

Natal.—The whole province except the Alfred and Port Shepstone districts are infected, but most cases were of a mild form, with low mortality.

Transvaal.—The whole province was infected last year and isolated cases continued to occur in several districts.

Cape West.—The disease made its appearance in the Paarl district during 1946, but after September 1946 the disease spread throughout the Cape Peninsula and as far as the districts of Heidelberg, Swellendam and Montagu.

Cape East.—Cases occurred in Elliot, Glen Grey, Queenstown and Stutterheim until November 1946.

Transkei.—The disease was reported in the districts of Tsolo, Butterworth, Elliotdale, Idutywa, Kentani, Mqanduli, Nqamakwe, St. Marks, Umtata, Willowvale, Umzimkulu and Mt. Currie.

Orange Free State.—The southern portion of this province still remains comparatively free from the disease. New outbreaks continued to occur, particularly in the Harrismith and Vrede districts, throughout the summer.

Control Measures.

The Union has been divided into the following areas:—

1. East Coast Fever areas infected with lumpy skin disease.
2. Non-East Coast Fever areas infected with lumpy skin disease.
3. A buffer area comprising the southern portion of the Orange Free State and the adjoining area of the Cape Midlands.
4. A protected area comprising the Cape East and Eastern Cape Province.

The following table indicates the incidence of the disease:—

Province.	No. of outbreaks.
Natal.....	960
Transvaal.....	846
Cape.....	1,722
Transkei.....	67
Orange Free State.....	170
	<hr/> 3,774 <hr/>

East Coast Fever.

Natal.—During the year there was one outbreak of East Coast Fever in each of the districts of Vryheid, Pinetown and Pietermaritzburg. In respect of the outbreak in the Vryheid district the cattle have been temperated out on to clean areas and the infected farm will remain free from cattle for 18 months. Three farms in the province (all in the Vryheid district) became clean by lapse of time.

During the year 462,288 deaths due to various causes occurred out of a cattle population of 2,528,405. The number of smears examined was 478,099, which includes a balance left over after the close of last year.

Transvaal.—There was no outbreaks of this disease during the year and the position is satisfactory.

The number of smears examined was 106,792 as compared with 108,606 deaths.

Cape East.—There were two outbreaks in the Komgha district and both farms were cleared by slaughter.

The number of smears examined was 30,566.

Transkei.—There was one fresh outbreak in an old infected tank area, Libode district, after 21 months without any deaths. The area has been fenced off and all cattle were temperated out and removed to the adjoining tank area for 30 days' quarantine.

One tank area in the Libode district became clean by lapse of time.

The number of smears examined was 153,873.

Orange Free State.—The number of smears examined was 1,118.

Foot and Mouth Disease.

The Union remained free of infection, but precautionary measures are still in operation in the eastern Transvaal, adjoining the Kruger National Park.

SAFEGUARDING THE UNION'S LIVESTOCK INDUSTRY.

Anthrax.

There has been an increase in the number of outbreaks in the various provinces.

Intensive propaganda is still being carried out amongst stock owners.

Regular annual inoculations still take place, involving over three million head of cattle.

The following table indicates the incidence of the disease:—

Province.	No. of outbreaks.	No. of deaths.
Natal.....	66	173
Transvaal.....	147	847
Cape.....	45	124
Transkei.....	16	25
Orange Free State.....	64	330
TOTAL.....	338	1,499

Last year the figures were 324 and 1,108, respectively.

Scab.

There were 27 outbreaks as compared with 11 outbreaks last year.

These outbreaks occurred in the following districts:—

District.	Outbreak.	Remarks.
Gordonia.....	6 { 2 generalized scab. 4 infra-orbital only.	Introduced from Kenhardt.
Kenhardt.....	12 { 7 generalized scab. 5 infra-orbital only.	Origin unknown.
Mafeking.....	2	Origin unknown.
Amersfoort.....	2	Attributed to introductions from adjoining territories.
Ermelo.....	1	Attributed to introductions from adjoining territories.
Piet Retief.....	4	Origin unknown.
	<u>27</u>	

Goat Mange.

The following outbreaks were reported:—

Natal.....	10
Transvaal.....	—
Cape.....	42
Transkei.....	13
Orange Free State.....	—
TOTAL.....	65

The small-stock census shows the following figures, with the figures for the previous year given in parentheses.

Woolled sheep.....	25,681,563	(28,121,222)
Non-woolled sheep.....	7,064,017	(6,439,797)
Angora goats.....	497,916	(564,314)
Other goats.....	5,167,603	(5,207,105)
TOTAL.....	38,411,099	(40,332,438)

Mange in Other Animals.

Cases of mange were discovered in various areas and dealt with. The following outbreaks occurred:—

Province.	Equine Mange.	Bovine Mange.	Pig Mange.
Natal.....	6	1	2
Transvaal.....	2	2	1
Cape.....	6	54	—
Transkei.....	32	6	—
Orange Free State.....	1	7	—
TOTAL.....	47	70	3

Tuberculosis.

The number of herds under official test shows a slight decrease, but there is no doubt that if the necessary staff were available, many more breeders would come in:—

Province.	Herds.	No. tested.	No. of animals infected.
Natal.....	7	2,319	17
Transvaal.....	13	1,823	34
Cape.....	70	8,352	15
Transkei.....	1	272	—
Orange Free State.....	13	1,852	—
TOTAL.....	104	14,618	67

Nagana.

This is the most serious disease in southern and northern Zululand, and caused very heavy mortality. The disease has had a very high incidence in the districts of Hlabisa, Lower Umfolozi, Ngotshe, Nongoma, Ubombo, Eshowe, Piet Retief, Entonjaneni and Mahlabatini, and a lesser incidence in the districts of Ingwavuma, Mtunzini, Babanango and Vryheid.

It has been estimated (on a conservative basis) that since 1945 over 10,000 head of cattle died in the area of the Government Veterinary Officer, Eshowe (southern Zululand). In northern Zululand and the adjoining districts of Ngotshe, Piet Retief, Vryheid and Babanango this figure was greatly exceeded.

Epizootic Lymphangitis.

Three cases were reported in the Peddie and Victoria East districts. The animals were destroyed.

Rabies.

Outbreaks were dealt with as they were discovered.

The following cases were diagnosed either histologically or biologically:—

Province.	No. of outbreaks.	Species.
Transvaal.....	1	1 bovine.
Cape.....	3	1 bovine, 1 canine, 1 jackal.
Orange Free State.....	10	1 porcine, 1 feline, 1 canine. 1 bovine, 2 surricates, 3 Cynictics, 1 wild cat.
TOTAL.....	14	

Chemical Services for the State.

J. P. van Zyl, B.A., Ph.D., Chief, Division of Chemical Services.

THE activities of this Division cover a wide field, and there has been an increasing demand from other bodies and institutions for services. It has not always been possible to meet these demands to the fullest extent. At present the Division maintains three main laboratories, namely at Pretoria, Johannesburg and Cape Town, and has officers at the Nelspruit Experiment Station, the Vaalharts Experiment Station and the Chicory Control Board, Alexandria, while the Director of the Leather Industries Research Institute is also an officer of this Division. The temporary laboratory at Port Elizabeth is nearing completion and two or three units will be stationed there shortly. A sub-laboratory is stationed at the Government Printing Works. Though the Division has no experimental station of its own, it collaborates with other Divisions in undertaking field investigation work at centres under the latter's control.

The work undertaken may be of an advisory, a regulatory, a routine or an investigational nature. Much time is devoted to advisory work, covering a wide range of subjects. The regulatory work is carried out mainly at Johannesburg and Cape Town, and arises from the need for control under various Acts.

Apparatus and Equipment.—The position in regard to supplies of apparatus and equipment is slightly easier but, owing to the fact that efforts must be made to meet the deficiencies created during the war years, it has not yet been possible to obtain any of the more specialized equipment.

The stores-registers reflect stores and equipment to the value of £26,000, £6,500 and £7,500 as being on hand at Pretoria, Johannesburg and Cape Town, respectively.

Library.—Additions of books and periodicals continue to be made to the library, and at present there are 2,000 books and some 4,000 journals, most of the latter being bound. Owing to the war, gaps appeared in many of the current journals and, while some of the back numbers have been procured, it is, in most cases, extremely difficult to obtain missing numbers.

The fittings and furniture for the library in the Pretoria laboratory have been supplied, and the library is now an efficient unit in the Division.

Staff.—The resignation of officers and the difficulty of obtaining suitable candidates continue to be a marked feature of the staff position.

Much of the time of the senior officers has been occupied with advisory work on various committees connected with such bodies as the Council for Scientific and Industrial Research, and the Standards Bureau, and much use has been made of the accumulated experience of the Division, which is also represented on many sub-committees of the Standards Institute and Standards Bureau, to draw up standards and specifications for a large variety of materials such as wool, glue and gelatine, salt, paper, oils, timber preservatives, type metals, etc.

Work at the Various Centres.

Pretoria Laboratory.

The work of the Pretoria laboratory may be roughly divided into three main sections, namely: (a) soil survey, (b) soil fertility, and (c) general and applied chemistry.

(a) *Soil Survey*.—This section has been fully occupied in rendering services to various bodies, and the following summary of the work undertaken during the past year will indicate the activities of the section:—

- (1) Since April 1947 three soil-survey parties have been engaged in an investigation of the soils of the Orange-Fish-Sundays River Project and its possible extensions. These parties have been stationed at Barkly Bridge, Conway and Trollip.
- (2) Services have continued to be rendered to the Native Affairs Department in connection with the Rehabilitation of Native Areas in the Transkei, Ciskei, Transvaal and Natal.
- (3) The Rhenosterkop Island Irrigation Scheme at Kakamas has been investigated from the point of view of "brak" reclamation.
- (4) An intensive survey of the proposed experimental station at Bethal has been completed. This site was intended to serve the needs of the highveld "mealie belt", but the soils were not found to be sufficiently representative. Other sites will now be investigated.
- (5) An officer assisted in the work of the Anglo-Economic Survey of the northern Transvaal, a distance of about 4,000 miles being covered to fix the boundaries of this region.
- (6) A rapid investigation was made of the soil profile at the Brandvlei Dam, Worcester, in connection with the proposed raising of the retaining wall.
- (7) At the request of the Department of Lands the problem of "brak" reclamation and water-logging was studied at the Olifants River Settlement at Van Rhynsdorp, and an officer has been stationed there to serve on the *ad hoc* committee formed to deal with the problem.
- (8) An officer was sent to Koekenaap to assist in the problem of draining and reclaiming irrigated land.
- (9) An inspection was made of the Stella Londt Institution for Consumptives on behalf of the Defence Department, and a report submitted.
- (10) Professional assistance was rendered in a court case in connection with ground along the Buffalo River near Kingwilliamstown.
- (11) An officer served on an *ad hoc* Planning Committee of the Native Affairs Department in connection with "The Siltation of the Henley Dam" and a report on this matter was submitted.
- (12) Reports and charts were prepared in connection with various irrigation schemes such as Modder River, Kakamas, Buffelspoort and Njelele.

CHEMICAL SERVICES FOR THE STATE.

(b) *Soil Fertility and Fertilizers.*—The work of this section continues to be hampered by the lack of a pot-house. However, advisory work on soils and soil requirements for farmers and small-plot holders has been continued and is based upon the use of rapid chemical methods.

The Division has an officer stationed at Vaalharts and in co-operation with officers of the Division of Agricultural Education and Research he has been responsible for work on fertilizer treatments, irrigation studies, rotation experiments, etc. The statistical treatment of harvest data and the analytical results has been completed for the first progress report of the Vaalharts Experiment Station.

Field experiments on chicory and measures for the control of insect pests on this crop are being carried out at Alexandria in co-operation with other Divisions. Some field experiments and dehydration work on chicory have been concluded, but work is being continued on the relationship between the roasting-time, temperature and tinctorial power of roasted chicory. A bulletin is in course of preparation dealing with all phases of the work on chicory.

A large number of samples of soil, grass, maize, wheat, lucerne, etc., are being analysed. These samples are from field experiments scattered throughout the country and the work has been undertaken to establish the relationship between quality and soil conditions.

Reports have been drawn up on field experiments conducted at Cedara, Kroonstad and Grootfontein, and assistance has been given in planning a complicated rotation experiment for the Tobacco Research Station at Rustenburg and in designing a fertilizer-rotation experiment at Athole.

An officer of the Division has been stationed at Nelspruit Experiment Station to carry out chemical work. The results of long-term experiments with various vegetable and green-manure crops on plots receiving manure and phosphate have been collated. A comprehensive series of pot-experiments is in progress to investigate the new "blueing disease" of tomatoes. Analyses of soils from the surrounding districts have been undertaken to determine the characteristics and fertility status of these soils.

A large number of soils from the Estcourt Pasture Research Station are being examined in an attempt to interpret unexpected results obtained in the field experiments. Soils from a number of tobacco areas are being examined to determine whether the severity of eelworm infestation is in any way correlated with the fertility status of the soils.

In conjunction with officers of the Geological Survey a deposit of phosphate rock was inspected and numerous analyses were made of a product made from this material to ascertain the form and availability of the phosphate in the product. Field experiments will be undertaken to test the agricultural value of the treated phosphate against known phosphatic fertilizers.

A wide variety of fertilizer samples have been analysed for nitrogen, phosphate and potash in order to ascertain their fertilizer value, on behalf of Fertilizer Control, as well as for private individuals. These samples included such materials as manures, bat manures, composts, etc.

(c) *General and Applied Chemistry.*—This section deals with a wide variety of work and a great deal of assistance has been given to various bodies and institutions.

A great diversity of samples of minerals, rocks, chromite ores, tin ores, etc., have been analysed for the Geological Survey, Geological Department of Swaziland and for the Universities under an agreement with the Council for Scientific and Industrial Research to the effect that the Division will assist the research work there by analysing samples of minerals and rocks. Samples of corundum for export have been analysed for the Department of Mines for grading purposes.

Analyses of water for irrigation and industrial purposes have been carried out for the Departments of Irrigation, Mines, Native Affairs, Geological Survey and for the Industrial Development Corporation, as well as for farmers and private individuals. In special cases determinations of iron, fluorine, potash and manganese have been made while in one case samples of water from two municipalities were tested for selenium, but with negative results.

Much work has been done in the field of insecticides. Two officers assisted in the experiments at De Aar on the use of aeroplanes for spraying locusts with solutions of benzene hexachloride. One of these officers has been attached to the field party which is attacking the locusts in their breeding ground in Tanganyika by this means.

Tests on the stability of pentachlorophenol in soils treated with an oil solution of this compound have been carried out for the Building Research Institute in connection with the termite-proofing of buildings. A method was developed for the determination of P.C.P. in treated soils and the results showed that this substance is extremely stable under normal soil conditions.

A D.D.T. smoke generator was designed and developed by officers of this Division and, after considerable experimental work in the laboratory and in the field, its efficiency was proved. It is now being manufactured on a considerable scale for use in the tsetse fly campaign in Zululand. During this work a method was developed for the determination of D.D.T. in the smoke from the generators.

Several pounds of 2:4:D were prepared for practical field tests on the destruction of weeds, and promising results have been obtained. Work has proceeded on the synthesis of allied compounds and an opportunity is awaited for testing these compounds as weed-killers.

An officer has been assisting the Film Unit of the Department of Education with the chemical work involved in developing and printing. He has succeeded in identifying a developer used in colour photography as being of the substituted p-phenylamine diamine type and has produced a practical bath capable of producing a coloured image.

The determination of the nor-nicotine content of South African tobaccos has been completed and the results are to be published. The constants of various oils have been determined such as in oil of the baobab tree, seeds of *Strychnos innocua*, and grenadilla seeds. A method has been developed for pulping the waste-paper from old tobacco wrappers, and by the incorporation of a binder, if necessary, it was found possible to produce pressed boards suitable for many purposes.

The copper content of rot-proofed bags has been determined for the Controller of Jute to ascertain whether such bags could be used for the transport of foodstuffs. It was found advisable to refrain from using such bags where there is a danger of the bags becoming

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wet or where the foodstuffs are not peeled before being eaten or cooked.

Samples of salt have been analysed and found to be normal except in one case where the salt was abnormally high in magnesium chloride. Experience has shown that the lime, magnesia and sulphate content are of major importance in determining the quality of the salt.

Government Printer's Laboratory.

The work in this laboratory is confined to the requirements of the Government Printer, but it is extremely varied and is of such a volume that no long-term investigations can be made by the present small staff.

The normal routine work involves numerous analyses of many varied materials such as type-metals, paper, inks, glues, gums, dyes, waxes, plating baths, etc., which are all tested for their suitability for use.

The officers are also required to supervise the manufacture of products such as inks, glues and pastes.

A limited amount of short-term investigational work is also carried out. Work on the improvement of meat-marking inks has been done, but has been delayed by several factors such as lack of carcasses and of certain necessary dyes. Extracts of tannins from wattle extracts have been prepared and derivatives prepared from these in an attempt to elucidate their chemical properties and to improve the "iron-blueing" properties when used for making ink. A method for the determination of tannin in inks has been developed and a report is being prepared for publication.

Johannesburg and Cape Town.

The work of the Division at Johannesburg and Cape Town is similar in nature and consists essentially of regulatory work under various Acts, such as the Foods, Drugs and Disinfectants Act; the Wine, Spirits and Vinegar Act; the Fertilizers, Farm Foods, Seeds and Remedies Act; and the Agricultural Export Act; as well as work for the Departments of Customs and Excise, Justice, Public Health and Mines, and general work for the P.W.D., Provincial Administrations, municipalities and other bodies.

During the year some 9,500 samples of a widely varying nature were analysed in the Johannesburg Laboratory, an increase of nearly 50 per cent. over the previous year. Here 3,130 samples were analysed under the Foods, Drugs and Disinfectants Act, No. 13 of 1929, and 223 did not comply with the provisions of this Act; 1,330 samples of liquor were examined under the Wine, Spirits and Vinegar Act, No. 15 of 1913, an increase of about 200 per cent. over the previous year, and 350 failed to comply with the regulations under this Act; 970 samples were analysed for Customs and Excise purposes; and 1,350 exhibits were examined for the Department of Justice.

It may be mentioned that all the toxicological work for the Union and the Protectorates is carried out in the Johannesburg Laboratory and the only work of this nature carried out in the Cape Town Laboratory is the determination of alcohol in brains and certain investigations on behalf of officers of the Department of Public Health in Cape Town.

The work in these two sections increased by 30 per cent. during the past year. The tariff value of the work carried out was about £35,000. It is clear that there has been a great increase in the work during this period and, as a result, the staff have found it increasingly difficult to cope with the work.

In the Cape Town Laboratory the distribution of the work differs slightly from that in Johannesburg since the major portion consists of the examination of wines and spirits under the Agricultural Export Act, No. 35 of 1917. During the year the total number of samples examined was 9,800, of which about 6,700 were wines and spirits under the above Act. This represents a decrease over the figures for the previous year and is due to restrictions which have been imposed upon the exports of brandy and gin. Here 340 samples of wines and spirits were analysed under the Wine, Spirits and Vinegar Act, No. 15 of 1913, and 55 failed to comply with the provisions of this Act; and 1,480 samples were analysed under the Foods, Drugs and Disinfectants Act, No. 13 of 1929, and 150 failed to comply. Eighty-three gallons of Chaulmoogra Esters were prepared for use by the Public Health Department.

The tariff value of the work done was about £20,000.

Investigation.

Owing to the staff position it has not been possible at any of the Divisional laboratories to undertake any long-term investigations, but a good deal of time has been devoted to solving immediate problems. In addition to the work mentioned earlier, the following also deserves mention:

Methods of extracting tung oil from various types of tung nuts were examined and the constants of the extracted oils were determined. A report on this work was submitted to the Nelspruit Experiment Station. The iodine-value and the refractive index of various samples of pig-fat were determined as part of an experiment to ascertain whether the quality of the fat was related to the feed of the pig. These constants appear to be related to the hardness of the fat but the range of the refractive index was found to be too small to be of much practical use.

The moisture and nicotine content of samples of tobacco were determined in order to ascertain the influence of spacing upon the nicotine content of *N. rustica* and Dadole 73. The most efficient spacing for the greatest yield of nicotine per morgen was found to vary with the type of tobacco. Various methods of determining the moisture content have been examined, and the results and conclusions have been prepared for publication.

Work on a method of assessing the freshness or otherwise of fish and meat products has been continued, as well as the work on chemical changes in bottled wines. An investigation has been started on the problem of detecting attempts to "water" milk with salt or other solutions which, if used in place of water, would vitiate the conclusions drawn from the freezing point method.

Ammonia and nitrate-nitrogen studies in citrus and vegetable experimental plots have been started at Nelspruit. The carbon-nitrogen balance and base-exchange studies in soils from that area are being investigated.

The Business Aspect of Farming.

S. J. de Swardt, B.A., M.Sc., Chief, Division of Economics and Markets.

CONSIDERING the depleted staff at its disposal, the field covered by the Division of Economics and Markets during the past year, was satisfactory. The energetic programme commenced during the previous year, could be continued.

Research.

The following work was carried out in the sphere of scientific research:—

(1) Agro-Economic Survey.

By the end of the previous year, the field work covering the central western Orange Free State, the western and northern portions of the Transvaal and the north-eastern Cape Province (Bechuanaland) had been completed in collaboration with other Divisions, and during the past year these data were elaborated and a commencement made with the compilation of reports. In the parts of the Transvaal covered by the survey, comprising about two-thirds of this Province, nine new areas were delimited and described, which, together with the eight areas already described, bring the total up to seventeen areas. In the O.F.S. two new areas were added to the five previously completed, leaving only the Karroo portion of the south-western O.F.S. to be delimited. The north-eastern portion of the Cape province as far as the Kalahari was divided into four areas, leaving only the Karroo and the fruit areas for delimitation in this province.

In all, about one-third of the Union remains to be delimited and described.

(2) Farm Management and Costing Survey.

At the beginning of the past year, a farm management and costing survey, designed to cover a period of at least five years, was initiated in regard to the three principal maize-producing areas of the Union, viz. the Transvaal highveld, the north-western Orange Free State and the Caledon River cropping area of the Orange Free State. In the three areas mentioned in this order useful data were obtained from 103, 93 and 98 farmers respectively. These data have already been elaborated and summarized, and the survey staff is at present engaged in collecting data in connection with the second year.

Although the investigation is mainly concerned with farm management detailed data are also collected for the calculation of the production costs of maize, wheat and milk, which rank amongst the principal agricultural products of these areas.

During the past year a statement was drawn up in which the result of farming operations for the first year of the survey of every farming co-operation is compared with the average result for the area as well as with the average of the ten best and the ten worst farms in the area, based on the year's results. The field officer will explain these comparisons personally to every farmer concerned. It is hoped that this comparative statement will stimulate the interest which is being displayed by co-operating farmers in this investigation.

(3) Investigation into the Marketing of Potatoes.

During the past year the Division instituted the investigation into the marketing of potatoes in the nine principal cities of the Union. Data were collected on the production, supply, grading and prices of potatoes on these markets and an analysis was made of the main factors influencing the trend of prices on the markets.

It was found, *inter alia*, that the production of potatoes is subject to a strong seasonal influence necessitating the marketing of the crop within a fairly short period. The extent of the supply does influence the price trend, but since the war with its dislocating influence, the effect of supply is no longer clearly determinable. Another very important factor is, for example, the proportions in which potatoes of the various grades are marketed. It appears that the presence of a relatively high percentage of grade III potatoes has a very depressing effect on prices.

The results of this investigation, have been elaborated in "Farming in South Africa".

With the addition of further data, it is hoped to publish it in pamphlet form too.

(4) Investigation into the Marketing of Eggs and Poultry.

In this investigation, data were obtained from the principal wholesalers in these products in the most important large cities as well as from egg circles and municipal markets. Furthermore, an analysis was made of the trends of prices paid for various classes of eggs and poultry. The areas supplying each of the principal markets were determined. The results of the investigation have also been elaborated in an article for publication in "Farming in South Africa".

(5) Farm-Labour Survey.

Unfortunately, the farm-labour survey, with special reference to its economic and social aspects, which had already been started in the winter-rainfall area, could not be continued during the past year, mainly on account of staff shortages. The data in connection with the investigation in the winter-rainfall area were further elaborated during the past year and it is hoped that more details will be published during the coming year.

(6) Analysis of Market Data for Eight Tropical Fruits on Eight Municipal Markets.

A beginning was made with the extraction and compilation of data on the quantities offered and sold, and the prices obtained on the eight principal municipal markets of the Union for eight tropical fruits, viz., paw-paws, mangoes, avocados, bananas, grenadillas, pineapples, litchis and guavas. Most of the data are available in rough form on the market records of the Union, but they are now being compiled in a form allowing of analysis. The intention is to keep these analyses up to date as in the case of vegetables, deciduous fruits and citrus fruits.

Other Activities of a Technical Nature.

(1) *Calculation of National Income from Agriculture.*—During the past year the calculation of agriculture's contribution to the national income was continued and to date the gross income from agriculture for the year 1945-46 has been calculated.

(2) *Price and Other Indices.*—The revision of the various series of indices for the agricultural industry, kept by the Division and published regularly in the monthly journal "Crops and Markets", was also continued.

(3) *Farm Bookkeeping and Costing Project.*—The farm-bookkeeping and costing project already operating in the Paarl agricultural area, East Griqualand and the Transvaal Highveld, was extended during the past year to the dairying area of the eastern Orange Free State, where 15 farmers are co-operating in the enterprise. Although the activities of the Division have up to the present been limited to publicizing and controlling the scheme in areas where it has already been established, the dairying costs data obtained from East Griqualand under the scheme, were also analysed during the year. The analysis was virtually a test of a new method of costing viz., the pool system, under which the total farming expenditure is placed against the single branch of the industry (in this case milk production) yielding more than 75 per cent. of the total farm income. Income from sales other than milk are entered as credits. Calculation of the production costs of milk on this basis for the second year is being awaited, after which the results may be published.

Supervision of applications of the Division's bookkeeping system on the demonstration farms of the Division of Soil Conservation and Extension was continued.

(4) *Crop Estimates.*—The work in connection with crop estimates was seriously hampered by the fact that no agricultural census was taken from 1940 to 1945. The first census after that was taken in August 1946, but except in the case of maize, the results were not available for crop estimates for the year 1946-47. The actual crop figures for the previous year are required in order to make a reliable estimate of standing crops. In the absence of census figures the best use had to be made of the crops received by the Control Boards.

The following crop estimates were made by the Division during the past year, for the 1946-47 season:—

Maize.—The area planted for 1946-47 was estimated at 3½ million morgen, an increase of 15 per cent. over the previous year's average. The first crop estimate in February 1946 amounted to 23·3 million bags, and the seventh and final estimate was 24·483 million bags.

Wheat.—The area planted for 1946-47 was estimated at 1·405 million morgen, showing an increase of 32·5 per cent. over the estimate for the previous year. The first crop estimate amounted to 5·480 million bags and the fifth and final estimate to 4·428 million bags.

For other products the estimates for the 1946-47 season are as follows:—

Kaffircorn.....	600,000 bags
Groundnuts.....	680,000 „
Potatoes.....	4,710,000 „
Beans.....	335,000 „
Oats.....	1,757,000 „
Barley.....	611,000 „
Rye.....	378,000 „

In estimating the production of summer and winter crops, use was made of the reports of about 6,000 reporters from the principal production areas.

For wool production there are 27,000 crop estimators.

Crops and Markets.—The monthly publication of the Division, namely "Crops and Markets", continues to be published as a supplement to the Departmental journal, "Farming in South Africa". Arrangements are being made, however, for separate publication during the course of the coming year. Details will be published in "Farming in South Africa". The journal regularly contains tables of prices of the principal agricultural products, price indices of agricultural products and requirements as well as market reviews and articles of economic importance.

(5) *Lectures in Agricultural Economics.*—For years now, officers of this Division have been giving lectures in agricultural economics at the colleges of agriculture, except Stellenbosch-Elsenburg which is served by the University of Stellenbosch.

It was decided to station a full-time professional officer at each of the five colleges of agriculture, namely, Potchefstroom, Glen, Cedara, Grootfontein and Stellenbosch-Elsenburg. These officers will be responsible for part-time lectures in agricultural economics and farm-bookkeeping and part-time research in the area served by the college.

A course in farm-bookkeeping is also given at the University of Pretoria by an officer of the Division.

Staff.

Although the Division succeeded in improving its staff position during the course of the past year, the lack of experienced officers was severely felt.

During the year the Chief of the Division went overseas twice as a member of Union delegations to International Conferences in Copenhagen, London and Geneva. The Assistant Chief, Mr. C. H. Spamer, is still seconded to the Directorate of Food Supplies and Distribution, and the principal Professional Officer, Dr. A. J. Beyleveldt, was abroad for the major portion of the year as a member of the Union delegation to the Geneva Conference on Trade and Employment.

Inland Marketing.

Intelligence Service.

(a) *Produce Market Reports.*—As in the past, daily, weekly, monthly and annual reports on the municipal produce markets of the nine principal cities of the Union, viz., Johannesburg, Cape Town, Durban, Pretoria, Bloemfontein, Port Elizabeth, East London, Pietermaritzburg and Kimberley, were compiled, consisting of a review of marketing conditions and a price report. The latter gives information on the quantities sold and the lowest, highest, and weighted average prices. The daily and weekly reports were regularly furnished to the Broadcasting corporation and the Press for broadcasting and publication respectively. Weekly reports were also regularly provided to farmers' Associations, government departments and private persons and bodies. A national radio broadcast at 8 a.m. from Johannesburg, was extended during the year by the addition of prices of certain East-Rand markets.

(b) *Wool Reports.*—From September reports were again compiled regularly in collaboration with the South African Wool Sales Organization, and submitted for broadcasting and publication.

(c) *Hides and Skins Reports.*—Weekly reports were compiled from reports received from the various Inspectors of Hides and Skins in Union ports. These reports were sent to the Press and to the Broadcasting Corporation.

(d) *Market Bulletin for Housewives*.—As in the past, a short special report for housewives was again compiled daily by the Johannesburg office and handed to the press and the radio.

(e) *Retail prices*.—In the 'above-mentioned' nine large cities, weekly prices of the principal products were regularly obtained from retailers.

Outstanding Features on the Nine Major Municipal Markets during 1946-47.

The supply of peaches to these markets was much smaller than during the previous year, due mainly to poor crops in the various production areas.

The supply of oranges was considerably larger than during the previous year.

Owing to frost damage, tomatoes were supplied in smaller quantities.

Potato supplies were abundant and fairly serious gluts occurred on some markets. Considerable quantities were exported.

Owing to the shortage of jute bags, 37½ lb. pockets were introduced for the marketing of potatoes, considerably facilitating reporting.

On the whole, onion supplies were very small.

Supplies of dressed and live poultry showed a sharp decline.

Supplies of certain vegetables from the Transvaal lowveld were much smaller during July and August this year, owing to frost damage.

Military purchases and purchases for ships were completely discontinued by the Directorate of Food Supplies and Distribution.

Compulsory Grading.

The grading of citrus fruits, deciduous fruits, meat, eggs and potatoes was made compulsory in the following areas:— Johannesburg, Cape Town, Durban, Pretoria, Bloemfontein, Port Elizabeth, East London, Pietermaritzburg and Kimberley.

In connection with meat it should be mentioned that the grading of all carcasses in the areas mentioned is carried out by graders of this Division. The following total numbers of carcasses were graded in the nine controlled areas (for the year 1 September 1946 to 31 August 1947):—

Cattle.....	789,902	carcasses
Sheep.....	907,485	"
Pigs.....	191,695	"
Goats.....	25,638	"
Calves.....	84,985	"
Lambs.....	634,658	"

Appeals were made in respect of 75 carcasses, viz., 37 cattle carcasses, 37 sheep carcasses and 1 pig carcass. Of these, 12 were successful, viz., in respect of 5 cattle carcasses, 6 sheep carcasses and 1 pig carcass.

As regards the other products, only a portion of the consignment was inspected for grading.

As from January 1947, a regular inspection service was also instituted for the East and West Rand markets.

Sales premises are visited regularly in connection with the compulsory grading regulations. In Johannesburg alone more than 1,400 such visits were made, of which 80 resulted in prosecutions. Owing to staff shortage, however, this part of the work could not be carried out satisfactorily.

TABLE A.—NUMBER OF CONTAINERS OF ALL TYPES OFFERED FOR INSPECTION ON THE NINE MAJOR MARKETS.
(Sept. 1946–Aug. 1947)

Product.	Johannesburg.	Pretoria.	Pietermaritzburg.	Durban.	East London.	Port Elizabeth.	Bloemfontein.	Cape Town.	Kimberley.	Total.
Potatoes.....	1,010,288	210,295	44,050	595,062	102,393	81,197	58,917	231,234	32,903	2,366,339
Apples.....	235,433	63,500	18,883	62,610	24,523	19,750	27,034	82,893	11,831	546,187
Grapes.....	418,290	96,447	26,682	159,599	51,753	30,405	29,320	98,630	13,155	923,681
Pears.....	82,845	18,710	3,971	33,523	10,679	12,534	1,682	23,071	3,317	190,332
Peaches.....	302,058	56,850	23,017	102,381	29,441	12,405	31,784	54,794	20,410	633,140
Plums.....	43,133	3,546	3,010	34,389	3,643	578	1,227	32,419	2,423	124,368
Oranges.....	1,453,368	346,731	128,795	180,428	110,909	172,107	88,906	515,744	34,671	3,030,959
Grape fruit.....	70,129	3,497	2,892	9,457	2,218	3,915	1,066	22,611	1,553	117,338
Lemons.....	117,512	9,910	3,363	2,291	5,529	5,423	2,708	39,410	326	185,472
Naartjies.....	202,240	16,821	23,295	2,400	6,477	281	12,047	20,729	3,208	287,468
Eggs (dozen).....	2,600,222	205,479	166,752	124,693	126,277	295,230	122,700	445,620	70,980	4,157,353

TABLE B.—NUMBER OF CONTAINERS OF ALL TYPES OF WHICH THE CONTENTS WAS GRADED DOWN AND CONDEMNED ON THE NINE MAJOR MARKETS. (Sept. 1946–Aug. 1947).

Product.	Johannesburg.	Pretoria.	Pietermaritzburg.	Durban.	East London.	Port Elizabeth.	Bloemfontein.	Cape Town.	Kimberley.	Total.
Potatoes.....	224,284	26,742	38,639	66,910	18,712	10,692	16,666	39,827	5,384	446,856
Apples.....	57,804	16,956	6,553	12,386	4,553	1,338	3,803	20,473	1,600	125,466
Grapes.....	99,065	8,678	6,175	39,645	11,430	2,885	5,536	15,465	822	189,701
Pears.....	24,127	2,853	13,787	3,552	916	2,306	189	8,232	1,069	57,030
Peaches.....	29,922	480	4,159	17,808	3,683	1,459	5,357	3,938	4,543	71,349
Plums.....	4,691	231	56	6,817	948	306	130	2,367	363	15,309
Oranges.....	72,968	5,169	1,91	7,958	5,843	6,991	491	23,634	1,297	125,442
Grape fruit.....	5,751	59	75	2,424	42	124	81	1,910	129	10,696
Lemons.....	7,050	164	67	281	125	91	83	579	26	8,466
Naartjies.....	31,954	1,697	507	100	357	37	3,808	1,198	941	40,599

THE BUSINESS ASPECT OF FARMING.

On the whole, the quality of peaches, pears and plums marketed by the Deciduous Fruit Board, was satisfactory. The quality of grapes, however, left much to be desired. About 26 per cent. of the grapes from the western Cape Province was marked down to under-grade on the Johannesburg market.

Table A shows the number of containers of all types offered with contents for inspection on the markets in the nine controlled areas, and Table B shows the number of containers of all types, the contents of which was either condemned or graded down on these nine markets.

During the year, provision was made in the compulsory grading regulations for a fourth grade, namely undergrade, the requirements for Grades II and III being raised.

Disseminating information on compulsory grading could be carried out on a much larger scale than during the previous years. The importance of this work makes further extension imperative.

In the case of potatoes, the main reasons for grading down were: wateriness, insect damage, and brown rot.

The grading of meat still remains the cause of many difficulties. Complaints to the effect that grading was too strict, were often received. All complaints were carefully investigated and where possible, the aggrieved parties were visited in order to discuss matters with them. In most cases complaints were based on a misunderstanding. A few complaints went so far as to appeal against the grading. These appeals were mostly unsuccessful, as pointed out above.

Regular visits by the liaison officer to branch offices ensure uniformity in the standard of meat grading. At the Pretoria abattoirs the percentage of cattle condemned for measles was high, viz., 6.9 per cent.

The National Mark Scheme.

Although this voluntary grading scheme was replaced by compulsory grading in the case of deciduous fruit, citrus fruit, meat, eggs and potatoes, it still remains in force on the Johannesburg, Pretoria and Bloemfontein markets in respect of sub-tropical fruits and all important vegetables. Both under the National Mark Scheme and compulsory grading, 5 to 10 per cent. of the containers of each consignment are opened and examined. Where products are approved under the National Mark, the date of approval is also stamped on the container, in order that buyers may satisfy themselves whether or not the products are fresh.

New registration under the National Mark Scheme also occurred during the year, e.g. 264 in the case of tomatoes, and 103 in the case of green beans.

That producers are well informed on the grading requirements is borne out by the fact that in the case of avocados, 99.4 per cent. was approved, and in the case of strawberries and mangoes 91.8 per cent. and 91.9 per cent. respectively.

Producers in the immediate vicinity of Bloemfontein marketed and retailed large quantities of vegetables under the National Mark Scheme which is very popular with these producers.

TABLE C.—Total quantities of principal products on the Johannesburg, Bloemfontein and Pretoria Markets offered under the N.M.

<i>Scheme.</i>	
Tomatoes.....	984,912 boxes
Pawpaws.....	165,318 Std. boxes
Avocados.....	49,238 boxes
Mangos.....	41,185 boxes
Slaughtered poultry.....	128,416 birds

Improvement of Farming Practices in the Union.

The Conservation of our Agricultural Resources.

**J. C. Ross, B.A., M.Sc., Ph.D., Director, Division of Soil
Conservation and Extension.**

IN last year's report attention was drawn to the passing of the *Soil Conservation Act* as the outstanding achievement in the effort to make the nation conscious of the dangers of soil erosion and to persuade the community as a whole to combat this evil. In addition, the formalities to be observed and the procedure to be followed in terms of the Act in order to have an area proclaimed a soil conservation district and to make the provisions of the Act applicable in such a district, were briefly explained.

It is gratifying, therefore, this year to be able to report that the work started by the passing of the Act has been uninterruptedly continued and that we are already well on the way towards realizing our aim, viz., the conservation of the country's resources.

The zeal and enthusiasm with which the farming community has suited the action to the word in the furtherance of conservation farming far surpassed all expectations. For example, from the coming into force of the Act in October 1946 up to 31 August 1947, no less than 57 soil conservation districts covering an area of 7,540,244 morgen were proclaimed, while the final proclamation of a further 31 conservation districts with an area of 3,404,861 morgen awaited only the completion of a few legal formalities. The proclamation of these conservation districts will bring the total to 88 districts covering an area of 10,945,105 morgen, representing more than 10 per cent. of the total area in the Union available for agricultural purposes.

By that time also, applications for the proclamation of a further 30 areas as conservation districts had been received. Since the mapping of these districts has not yet been completed, the total area can as yet not be accurately given.

This praiseworthy enthusiasm on the part of our farmers is proof of the serious view they take of the matter, and certainly inspires new faith in the reclamation and conservation of our soil and the stabilization of the agricultural industry in the Union.

This awakening, and the realization of the danger which, through all the years of overcropping, has been stealing upon us, must be regarded as the turning point in South Africa's agriculture.

However welcome this signal progress may be, it nevertheless makes great demands on the staff of this Division and requires extraordinary exertions on the part of officers to be able to keep up with the increasing duties resulting from this expansion. In order to be able to meet the situation, it was decided at the time of the reorganization to divide the Union into regions each of which would be served by a balanced team of professional officers operating under a Chief Regional Officer. This decentralization was effected during the year under review, and 5 *regional offices* with their headquarters at Pretoria, Bloemfontein, Pietermaritzburg, Queenstown, and Stellenbosch are at present serving the Union. The ever increasing bulk of the work and the divergent requirements of the different ecological regions of the Union, however, necessitate further subdivision, after which the Union will ultimately be served by 7 regional organizations.

IMPROVEMENT OF FARMING PRACTICES.

The great immediate task of the Division is to give guidance to the different district committees in the planning of farming systems for each individual farm in the various conservation districts. In this important work, upon which the success of the whole undertaking is dependent, the regional organizations are absolutely essential to assist the extension officers who, in the various regions, form the spearhead in the campaign for the application of conservation farming throughout the country, in their exacting task.

The regional officers, conscious of the duty devolving upon them, have made it their aim to divide their regions into farming areas as soon as possible, as a broad outline for the district committees in the planning of their respective conservation districts. Such a division of the Orange Free State has already been completed by the regional office concerned and was published in private agricultural magazines some time ago. The other regional offices are at present preparing such maps in respect of their regions; these will be ready for the press in the near future.

Unfortunately, the Division's operations are still hampered by the shortage of equipment such as machinery, tools and fencing material and also by the difficulty of obtaining suitably qualified



The above photo was taken during a recording of a programme in which wool matters were discussed under the chairmanship of Mr. Cornell. The participants are (from left to right) Messrs. Manie Wium, a farmer and member of the Wool Council, Mr. Jan Moolman, farmer and (Chairman of the Wool Council; a representative of the S.A. Broadcasting Corporation; Messrs. Gawie Maré and H. Cornell, Departmental officers.

persons for appointment as extension officers. It is hoped, however, that these difficulties will gradually be overcome. Naturally the number of available officers is continually fluctuating as a result of resignations and new appointments but at the close of the year under review, the Division had 61 extension officers and 81 technical assistants in the field.

Despite the limited staff at its disposal, the Division was nevertheless able to carry out a large variety of duties of considerable extent.

Altogether these officers paid 46,352 visits to 30,626 farmers on their farms, attended 1,537 meetings of farming bodies and gave 915 lectures and demonstrations which were attended by 36,197

persons. Films were shown on 441 occasions with a total attendance of 7,041, while at their offices these men were visited by 17,043 farmers, and wrote 34,379 advisory letters to the public.

Sectional Activities.

A. Soil Erosion Control.

Government aid schemes for soil erosion control, silos and grain tanks.

In view of the serious shortage of staff, the suspension of the existing schemes for the building of dams, silo's and grain tanks was considered in order to have more time available for pressing work in conservation areas and for the establishment of soil conservation districts. This plan has, however, been temporarily abandoned and applications for assistance under the old schemes are still increasing in spite of the fact that greater financial assistance is being offered to the farmer under the Soil Conservation Act.

In respect of erosion control works, a total of 11,070 inspections were carried out during the year under review, 10,202 under the bonus scheme and 868 not under the scheme. In addition 6,358 miles of contours were surveyed, of which 4,227 miles were completed under the bonus scheme.

With regard to silo's, 632 applications were dealt with and 267 final inspections carried out. The figures for grain tanks amount to only 51 and 11, respectively.

It should be noted that the number of contour survey miles, compared with that of the previous years, shows a considerable increase and that contour surveys not falling under the scheme have been extended by approximately 50 per cent.

In spite of the grain-bag shortage, farmers did not avail themselves to any considerable extent of the facilities offered under the grain-tank scheme. This may be due to a shortage of cement and steel wire, which had a retarding effect also on the construction of reservoirs and silo's. In spite of this, however, it is expected that the amount paid out in bonuses during the current financial year (April 1947 to March 1948) will constitute a new record.

The following table gives a review of the progress made and the financial assistance afforded under the schemes for the period from their inauguration to 31 March 1947 and for the first half of the year under review:—

Approved Works.	Provisional Valuations.	Bonuses Paid Out.
	£	£
<i>Erosion works, dams and reservoirs built since the inauguration of the scheme up to 31.3.47.....</i>	4,300,387	625,225
<i>From 1.4.47 to 30.9.47.....</i>	241,478	36,951
<i>Silo's and grain tanks built since the inauguration of the scheme up to 31.3.47.....</i>	—	69,614
<i>From 1.4.47 to 30.9.47.....</i>	—	3,319

The Soil Conservation Areas.

Up to the present, four soil conservation areas have been proclaimed in terms of section 26 of the Soil Conservation Act (Act No. 45 of 1946). Since the contrast between conservation areas and conservation districts, were fully explained in the previous annual report, and since no new conservation areas were established during

the past year, only a brief summary is given below in respect of the four existing conservation areas, viz.—

- (1) The *Tarka Conservation Area*, including the original Vlekpoort Conservation Area, at present covering 400 farms 500,000 morgen in extent.
- (2) The *Drakensberg Conservation Area* which, with the inclusion of three native locations, covers approximately 1,000,000 morgen.
- (3) The *Heuningklip River Conservation Area*, approximately 50,000 morgen in extent.
- (4) The *Tygerberg Conservation Area*, approximately 3,300 morgen in extent.

Since the State is responsible for most of the soil conservation works in conservation areas, the speed of the work is determined mainly by the availability of machinery, tools and staff. Although the Division has succeeded in obtaining several machinery units, most of the orders have not yet been executed. Added to this is the fact that the Division is compelled to make provision for machinery to be used in soil conservation districts. Unless the difficult position with regard to equipment and staff rapidly improves, no significant speeding up of the work in the conservation areas can be expected in the immediate future. It is even possible that the conservation areas will shortly have to surrender some of their trained men for work in conservation districts, a fact which may still further retard the work; and their equipped workshops will probably, temporarily at least, even have to undertake the maintenance of machinery in the conservation districts.

During the year under review, the Division concentrated its efforts on reclamation works on private farms with a view to placing farming in the Union on a sound basis as soon as possible. Government and private work in rivers and valleys on such farms, aimed at the stabilization of drainage areas, received much attention. In the Tarka Conservation Area, for example, 5 large weirs were constructed at a cost varying from £2,500 to £25,000 each. Four of these are already silted up and the stabilization on the silt areas by means of reeds and willow trees has already made considerable progress.

Badly eroded farms on which the owners could no longer make a living and on which the State had to undertake practically all the works, necessarily had to be bought by the State. In the Tarka Conservation Area 11 farms, totalling 17,234 morgen, were expropriated. On these farms 115 works have already been completed while 8 are under construction and 19 planned. The encouraging results obtained with grass planted for the protection of the works are of particular importance.

In the Drakensberg Conservation Area two farms on which an amount of £7,320 had already been spent on Government works, were bought up. Two other farms were bought on which no works have been commenced, and two more are still to be bought. It is expected that on these six farms, a total of £20,000 will have to be spent before the soil will once again be suitable for permanent use.

The extent and variety of the operations make it practically impossible to furnish a detailed review in a report of this nature.

Owing to the shortage of equipment and staff the activities in the Heuningklip River and Tygerberg Conservation Areas are as yet confined to preparatory work.

Financial aid given to land-owners in the Tarka and Drakensberg Conservation Areas to date, in respect of works undertaken by themselves is reflected in the following figures:—

	Tarka.			Drakensberg.		
	£	s.	d.	£	s.	d.
<i>Loans with subsidy—</i>						
Amount approved.....	5,070	0	0	2,148	5	0
Amount paid out.....	2,855	10	6	152	8	4
Amount written off as subsidy.....	1,574	4	11	76	4	2
<i>Loans without subsidy—</i>						
Amount approved.....	1,280	0	0	—		
Amount paid out.....	1,252	13	9	—		
<i>50% Bonus Scheme—</i>						
Estimated cost of works approved.....	49,723	6	0	27,161	9	2
Amount paid out in bonuses.....	5,896	0	9	1,817	14	0

Soil Conservation Districts.

The districts were proclaimed too late in the year under review to permit of carrying into effect any of the soil conservation works planned under the Act.

Next year planning in a considerable number of districts will certainly be carried to the point at which both farmers and the Division will be able to proceed with the construction of soil conservation works. Various soil conservation measures will also come into force.

B. Animal Husbandry.

In view of the natural intimate relationship existing between stock and veld it is inevitable that, in the first instance, the farming practises followed will determine whether a piece of land will be subjected to deterioration, erosion and declining productivity or whether it will improve and gradually become a greater asset.

For this reason, the adaptation of a specific form of stock-farming to its environment and the practical application of such a farming system on a sound basis obviously are primary requirements in the soil and veld conservation campaign.

The Division's activities in regard to animal husbandry are therefore aimed at gradually directing stock-farming along these lines.

The following is a brief review of the most important activities of the year:—

In terms of this Act, a total of 13,694 bulls were inspected by extension officers, with the following results:—

Passed.....	Registered bulls.....	2,779
	Unregistered bulls.....	4,477
Rejected.....	Registered bulls.....	278
	Unregistered bulls.....	6,160

We regret having to record that even to-day there is a tendency among some farmers to exploit the privilege granted them a few years ago in a case of emergency, viz. the temporary suspension of the penal provisions of the Act. More drastic steps will have to be taken to put an end to this obstruction (by fellow farmers) of the cattle farmers' attempts at stock improvement.

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Stock Improvement.

In addition to the bull-inspection work mentioned above, extension officers have in classing herds and giving demonstrations, also handled the following numbers of stock as part of their extension duties:—

Cattle.....	55,246
Sheep.....	42,080
Pigs.....	2,163
Horses.....	558
Poultry.....	58,835

To a certain extent, however, the advantages of improved breeding under the Stock Improvement Act are still lost in that the nutrition and management of herds do not keep pace with improvement in breeding. In many cases this is due to natural limitations and the failure of the animal to adapt itself to its environment, but in other cases it is the result of faulty practices such as defective veld management and inadequate provision of feed.



A cheap multi-arch wall to check the flow of water and to restore and stabilize the bed.

Indigenous Types.—On representations by farmers in the Drakensberg region of Natal, the Orange Free State and Transvaal, a Departmental Committee was appointed to investigate the merits of the so-called “Uys Cattle” for purposes of recognition under the Stock Improvement Act. The Committee’s recommendations, already published, have been accepted, and bulls of this type of cattle will in future also be selected in terms of the Act, but subject to the conditions recommended in the report.

The desirability of investigating the possibility of using other indigenous types for the establishment of stock farming in areas where conditions create insurmountable problems with regard to other breeds is also being considered. A committee to investigate this matter will be appointed in the near future.

Sheep Farming.

In sheep farming, successful veld management with sheep alone particularly in the eastern grass veld areas, is becoming increasingly difficult. This problem is also encountered, though in a lesser degree, in the drier regions, especially in areas where veld has to be reclaimed.

At the same time it is felt that everything possible should be done to put sheep farming, which plays such an important rôle in the economy of our agricultural industry on a firm footing. This industry is to-day being threatened by conditions created by the application of injudicious systems of sheep farming in the past.

As in the case of practically all branches of farming, the solution to the problem lies in *balanced* forms of farming, i.e. systems in which the desired balance exists between sheep, cattle and veld.

Although the ideal relationship between these three has not yet been determined for all the different types of veld, it may be said on the ground of observations made thus far that this relationship between sheep and cattle will vary according to the type of veld and other natural conditions, the rôle of cattle being relatively more important in the wetter parts of the country such as the eastern grassveld areas.

This system offers an effective method of reclaiming our pastures and protecting them against deterioration and at the same time placing sheep farming on a sound basis. It is gratifying, therefore, to see that the district committee of Ficksburg (the first proclaimed soil conservation district in the Union) paid special attention to this aspect in its planning of farming systems for the district.

The Karakul Industry.

With reference to the rapid development of the karakul industry it should be pointed out that the advantages of this form of stock-farming at the same time harbour a great potential danger. The hardness of this breed enables it to exist on pastures too badly deteriorated to maintain other breeds, with the result that, in the absence of sound veld management, this breed of sheep will carry the deterioration of the veld yet another step further before showing signs of suffering itself. Unless their numbers are kept well within the limits of the pasture's normal carrying capacity, this form of farming will certainly lead to deterioration of the veld.

While it is not intended to discourage the sound development of this branch of stock-farming, it is nevertheless felt that a stern warning against the exploitation of the karakul's hardness at the cost of the veld is justified at this stage.

The Poultry Industry.

The able manner in which poultry farmers have kept their industry going during the years of feed shortage is worthy of all praise. As a result, the industry could immediately profit by the improvement in the feed position and contribute its share in meeting the demand for more food.

Great difficulties were experienced in recruiting trained personnel for poultry extension work, but everything is being done to satisfy the demand. The poultry farmers themselves, however, were very active and have left no stone unturned in their efforts at stabilizing their industry. The adoption of the day-old chick scheme, and its significance for the future of the industry, serves as an example of the progress made during the past year.

C. Pastures.

The Veld.

On the assumption that farming is being carried on by Europeans on about 1,000,000 morgen of land in the Union and that approximately 90 per cent. of this area consists of natural grazing, it will be appreciated how very essential it is to maintain the production capacity of our pastures.

In addition to the fact that through the agency of man, the natural veld of the Union has been seriously damaged by trampling and overgrazing, injudicious veld-burning and the like, the precarious rainfall of the country is also a factor to be considered. Only one-third of the total area of the Union enjoys a rainfall of 25 inches or more per annum, and even this is generally characterised by irregularity in total precipitation from one year to another as well as from season to season. The sparsity of vegetation in the low-rainfall areas also tends to reduce the efficiency of the rainfall still further through rapid run-off and evaporation, and to promote surface erosion.

Most extension officers are expressing alarm at the encroachment of less valuable plants such as vermeerbos, rhenosterbush, bitterkaroo, januariebos, harpuisbos and others in the low as well as in the high-rainfall areas. This encroachment has assumed serious proportions during the past few years, particularly in the drought-stricken parts of the country.

The Division is actively encouraging the judicious subdivision of farms into camps, provision of drinking water and sound veld management with a view to ensuring a good cover of palatable plants and enhancing the production level of the veld itself. This work finds strong support in the provisions of the Soil Conservation Act.

The execution of this programme, however, requires an enormous amount of fencing and other material for the establishment of camps and adequate watering places. The shortage of fencing material has an extremely retarding effect on this part of the Division's work and every attempt is being made to procure necessary materials.

Artificial Pastures.

Valuable data on the adaptability of various grasses in the different areas are being obtained in co-operative demonstrations and in the research work done at the experiment stations of the Division of Agricultural Education and Research. The possibilities of artificial pastures for hay-making and ensiling purposes, as rest crops in crop-rotation systems and for general erosion control and conservation purposes appear to be very promising. Such pastures of *Hyparrhenia hirta* (short thatch) are playing an important rôle in the reclamation of denuded soil in the Drakensberg Conservation Area. Elsewhere there is a keen demand on the part of farmers for *Sctaria kazungula* seed and for the roots of Napier fodder and Nile grass. Owing to the exceptionally heavy demand, there is an acute shortage of such grass material.

Grass-seed Nurseries for Mass Production.

For the development of the soil conservation programme thousands of tons of grass seed, grass roots and other plant material will be required within the next few years. Most of the necessary stock is not supplied by commercial seed merchants and nurseries, and the unobtainability of this material will undoubtedly have a retarding effect on the activities of the Division. In order to overcome this difficulty, the establishment of nurseries for the mass

production of grass seed has become a necessity, and for this purpose 500 morgen of land has been acquired from the Department of Lands in the Ermelo district, where the work will be commenced during the present season. The Division intends establishing several similar nurseries in Natal and the Orange Free State, in addition to other smaller regional nurseries. In America, such grass-seed nurseries proved to be of the utmost importance, and expansion on these lines is essential.

D. Field Husbandry.

The general world shortage of foodstuffs and the sporadic rise in the prices of certain products, often disturb the balance between crops which is so necessary in sound farming practice. When, as a result of excessive price increases, certain crops become more profitable than others, there is always the danger of their being produced outside the areas ecologically suited to their production or their superseding other desirable crops to some extent. High prices often stimulate profiteering beyond the bounds of reasonableness, with the result that the soil is exhausted in the process. The application of sound conservation-farming methods should be maintained as far as possible in spite of price fluctuations.

Groundnuts.—Owing to the scarcity of oils and fats and the high prices consequently offered for oil-bearing seeds, great progress has been made in the cultivation of this crop. This cash legume crop can be successfully grown in various parts of the summer cropping areas. It is hoped, however, that farmers will always grow groundnuts in proper rotation with other crops such as maize and potatoes in order to avoid diseases and pests.

The production of 660,000 bags of groundnuts during the past season was a record. Although the growing of this product requires more knowledge and more judicious cultivation, fertilizing and handling than most other summer crops, attempts are being made to increase the yield still further in order to meet local requirements. It is gratifying in this connection to note that the production of groundnuts in rotation with maize shows an enormous increase in the western Transvaal and northern Free State.

Potatoes.—The seed-potato growers' scheme, which in 1941 was supported by only three associations with a production of 3,000 bags, has made good progress. At present there are 52 recognised associations organised in eight regional federations under a single South African Seed Potato Grower's Union. In the year under review, this Union tendered approximately 224,000 bags of potatoes for certification, of which 154,000 bags of 150 lb. each were approved. Of this quantity, approximately 40,000 bags were exported to Uruguay in South America and it is hoped that this trial shipment will meet with sufficient approval to result in a regular demand for this product in the future.

It is disappointing that more use is not being made of certified seed potatoes in South Africa. Generally speaking, potato growers still attach too much value to advertisements of first and second grade imported seedpotatoes in regard to which they have no assurance of freedom from virus and other diseases.

Two very instructive courses on the cultivation, diseases and handling of table and seed potatoes were given by the Division of Agricultural Education and Research at the Potchefstroom College of Agriculture. These courses offered excellent opportunities for seed-potato growers and for secretaries of associations to become

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acquainted with the requirements of seed-potato production, and should do much to ensure the maintenance of a uniform standard throughout the country.

Maize.—Due to unfavourable weather conditions and lack of the means of production, the maize yield in the Union was relatively low during the past few years. This year's yield, however, was considerably higher and with the possibility of larger supplies of fertilizers and more regular supplies of agricultural machinery, better crops may be expected in the future. Attempts were made to establish seed-growers' associations and this, together with the progress made in the production of hybrid maize seed, should in course of time have a beneficial effect on production.

Crop rotation systems were encouraged and are already being applied more generally.

Wheat.—The cultivation of wheat again took place on an extensive scale, a heartening fact under the present difficult food conditions. It is feared, however, that increased production without proper crop rotation has led to a serious deterioration of soil fertility in those districts where the crop has been cultivated for many successive years. In the western Cape Province especially, the introduction of measures to prevent the entire collapse of the fertility of wheat soils became imperative and it is hoped that farmers in that area will immediately avail themselves of the opportunity offered them in this respect by the Soil Conservation Act, in that way to reclaim and build up the fertility of our dry-land wheat soils.

Fodder and Pasture Crops.—Very promising results have been obtained with dry-land lucerne and Rhodes, *Setaria* and *Paspalum* grasses for hay and summer grazing; and also with Italian rye grass, *Phalaris* and clovers, in areas with suitable climates, for winter grazing.

Fibre Plants.—Large parts of the Transvaal and Natal are suitable for the cultivation of fibre plants. *Phormium tenax*, *Hibiscus cannabinus* (wild stock rose) and *Agave sisalana* (sisal) can be profitably grown in many of these districts. Plantings are already making good progress.

Rice.—Experience has shown that rice can be grown in many parts of Natal. It can be grown on a small scale in valleys between the cane fields and on a larger scale in the Umfolosi marshes and in certain parts of Pondoland. In the latter area, however, malaria is a serious handicap to successful exploitation.

Tobacco.—The cultivation of tobacco has made great progress in the Rustenburg-Brits-Marico area, but fungus and virus diseases should be more effectively controlled and better crop rotation practised generally.

The Conservation Farming Competition, held annually under the auspices of the Witwatersrand Agricultural Society, was this year conducted in the wheat districts of the winter-rainfall area and elicited a considerable amount of competition. The inspection and judging of the farms brought to light much interesting information. The competitors profit materially from their discussions with the judges who point out the shortcomings in their farming systems.

E. Weed Control.

In many parts of the country it is essential to eradicate weeds as well as worthless, noxious or poisonous plants and bushes before the advantages of better farming systems can be fully enjoyed and for this reason weed control figures prominently in the soil-conservation plans of the Division.

During the past year 34,758 inspections were carried out and 6,455 notices served in respect of weed control. A large number of farmers were also verbally instructed to eradicate weeds and according to reports this action has had good results.

General Weed Position.

Boetebos (*Xanthium spinosum*) and cocklebur are still the most troublesome weeds, on account of their Union-wide distribution and the trouble they cause the wool-farmers. Due to severe and extensive droughts, weeds were less common during the past season and it was not considered necessary to use weed-eradication teams along the Vaal River. The position as a whole, however, cannot be considered satisfactory. Complaints are still regularly received from farmers' organisations, and it is a well-known fact that in some parts, especially where sheep farming is not practised, farmers neglect the eradication of weeds. Complaints about infestations in native areas are also frequently received and it is contended that the kraal manure which the farmers obtain from locations is a serious source of weed infestation.

The *erect Star-bur* has in recent years increased to an alarming extent in certain bushveld areas of the Transvaal and special steps were taken to get the situation under control. In the bushveld of the Marico and Rustenburg districts an intensive campaign was carried out in this connection. Additional inspectors were sent to those parts to warn all landowners to fight this weed. The campaign had a very beneficial effect and one season's intensive propaganda brought the situation under control. This work will be continued in the coming season and similar campaigns are being planned for other badly-infested areas.

Spear thistle still occurs in the mountainous and high-rainfall areas of the country, but the position has greatly improved. This weed is not very troublesome and is a threat only on badly trampled veld. In some respects it is more of an asset than a pest and affords some protection to badly-damaged veld.

As regards *dodder* the position still remains unsatisfactory. Although excellent eradication work was done in most parts where lucerne seed is produced, some districts are still infested.

It would appear that *dodder* is on the increase in the veld; this is particularly noticeable in parts of the Orange Free State and the eastern Cape Province where Karoo plants serve as hosts for this parasite. As yet no economical remedy which is safe for animals has been found for the control of this weed.

The *Hakea* problem in the western Cape Province remains unchanged and this weed is rapidly increasing. Although aid schemes for its eradication have already been drafted, it has as yet not been possible to commence with any eradication work.

Few complaints in respect of poisonous algae were received during the past years and it was not found necessary to pay special attention to these. A large supply of copper sulphate is still kept on hand in case the position deteriorates.

Wild tomato which occurs only in parts of the Transvaal and Orange Free State is now completely under control and the few farms on which it is occasionally found, are receiving the necessary atten-

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State Aid.

State aid for the eradication of weeds was given only in respect of the following: *boetebos* and *cocklebur* on the banks of some rivers, *prickly pear*, *jointed cactus* and *camel-thorn bush*.

Teams were used to eradicate *boetebos* and *cocklebur* along the Olifants, Elands, Middle Letaba, Lévubu, Steelpoort, and Selons Rivers in the Transvaal Bushveld. Altogether 747 miles of river front were cleared at a cost of approximately £4 per mile.

This year no teams were used along the Vaal River.

Prickly Pear Eradication.—The eradication work undertaken under the two aid schemes made very good progress. The felling campaign was very successful, and it was considered advisable to terminate the departmental scheme in the “biological area” on 30 June 1947.

The felling method of prickly pear eradication is confined to the Karroo where the cochineal insect is thriving. In a number of districts along the coast, however, cochineal was badly attacked by diseases and parasites and for eradication purposes may be considered a failure. In order to exclude these parts from the provisions of the Weeds Act in respect of prickly pear, which has been proclaimed a weed in the rest of the Union, Proclamation No. 171 of 1940 was superseded by Proclamation No. 22 of 1947 which lays down that the “biological area” has now been reduced to include only the coastal districts where cochineal has failed.

Since the coming into force of the two prickly pear eradication schemes the following work has been carried out:—

Departmental Scheme.—240,515 morgen of prickly pear have been felled by departmental teams at a total labour cost of £63,475. 9s. 6d., i.e. at an average cost of 5s. 3d. per morgen. During the year under review 164,059 morgen were cleared on 232 farms at a cost of £21,344. 14s.

Subsidy Scheme.—Since the inauguration of this scheme applications have been received from farmers for the clearing of 1,005,717 morgen at an estimated cost of £295,867. Of this total 983,731 morgen have already been felled and an amount of £128,512. 12s. 7d. paid out in subsidies, 613,058 morgen (on 1,137 farms) having been cleared during the year under review.

Eradication of Jointed Cactus.—This work is being undertaken at Government expense and the teams previously used in prickly pear eradication have now been transferred for this purpose. Up to the present, 4,077 morgen have been cleared on 14 farms.

Eradication of Camel-thorn Bush.—The aid scheme for assisting farmers in the Oudshoorn district with the eradication of this dangerous weed, is making good although slow progress. The treatment of the plants with a 1½ per cent. arsenic pentoxide solution proved very successful, but it seems necessary to go over all infested areas three times in order to cover plants not treated during the previous season.

Bush-clearing in Zululand in connection with the Campaign against Nagana.

This bush clearing undertaken in Zululand by the Division as part of its campaign for the control of the tsetse fly was expanded considerably during the past year. Satisfactory progress was made. The work comprises the clearing of all bushes and trees in strips two miles wide around the Hluhluwe and Umfolosi Game Reserves, with the object of confining the tsetse fly to the Reserves where it will be destroyed by means of dusting with D.D.T. In addition, bushes

and trees are also cleared in a two-mile wide strip at Umsinduzi Poort to prevent penetration of the fly from the east. In the northern portion of Zululand along the Pongola River and also in the Hlosi Valley dense woods, in which the tsetse fly hatches, are being thinned out. The methods applied consist of the hand-clearing of the lighter bush types and the removal of larger bushes and trees by means of power machinery. The last-mentioned work is undertaken under contract by private firms. Up to the end of August 195,500 morgen of bush had been cleared.

Proclamation of New Weeds.

During the past year it was found necessary to have *tick berry* (*Lantana camara*) and also a dangerous variety of burgrass, viz. *Cenchrus veridis* (*knopklitsgras*) proclaimed as weeds. This was done by proclamation No. 167 of 1946.

A survey was made in respect of tick berry and it was found that approximately 10,000 morgen in Natal, in native as well as European areas, have become infested and that the weed is spreading rapidly. The infestation is mostly confined to the coastal region, but signs of penetration inland were also observed.

Cenchrus veridis, which was first discovered in the Union only last year and which had been imported from Central America by Indians in their grass bedding, was discovered at the Bluff in Durban. Steps were immediately taken to have this dangerous foreign grass eradicated. The infestation seems to be under control but a watchful eye is being kept on it.

Experimental work in Weed Control.

Thorough tests were made with the new weed-control remedy 2, 4-D and it was found that 45 different kinds of weeds are sensitive to this chemical. Gifblaar is also susceptible, and experimental work in connection with its control is being undertaken.

Small quantities of 2, 4-D were dispatched to various departmental institutions to be tested for its effect on various kinds of weeds, and much experience has been gained in this manner.

Weed Control in Native Areas.

After negotiation with the Department of Native Affairs it was agreed that weed control in native areas would be taken over by this Division. Since the regional offices of the Division were only recently organised and are not yet able to undertake this additional work, the matter could not yet be tackled. It is hoped, however, that the Division will shortly be in a position to do so.

F. Co-operative Demonstrations.

As indicated by the name, these demonstrations are carried out by the Division in co-operation with farmers on their farms.

Ordinary Demonstrations.

In these, one or more farming practices are separately demonstrated with a view to giving local farmers visual proof of the advantages of such practices. This form of extension service is of great value to farmers in that they can easily follow the technique used in the demonstration.

Field officers are well aware of this fact and they therefore make full use of this method. A very important aspect of this type of demonstration, which may perhaps be called minor or ordinary demonstrations, is that they should not be attempted on too small a scale. When, for instance, the cultivation of a pasture crop must

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be demonstrated, it is essential that enough of the crop be sown or planted to enable the farmer to graze a few animals on it. This type of demonstration has great propaganda value at schools or with the conservative farmer who has, as it were, isolated himself from his environment. A good stand of maize resulting from the application of fertilizers, or increased milk production by cows grazed on a patch of vetches generally has a very convincing effect on the farmer.



Oxen such as these, bred from a Kemp bull on Uys cows, were chosen from 23 spans to pull the wagon during the centenary trek.

The number of ordinary demonstrations were decreased during the year because among other things, all prickly-pear demonstrations had to be discontinued as a result of the cochineal danger. At present 305 of these demonstrations are being conducted.

Upon closer examination, the majority of these minor demonstrations appear to be concentrated on feed production, more particularly feeds which can be grazed. Legumes such as vetches, clovers and lucerne have been demonstrated on a large scale as pasture crops and as items in sound crop-rotation systems. Two weak links in our farming systems are beneficially affected by this work, viz. the shortage of feeds of good quality and the lack of a sound crop-rotation system to maintain the fertility of cultivated soils.

Whole-farm Demonstrations.

In contrast with the ordinary demonstration in which only one or two aspects of farming are dealt with, the *whole-farm system*, as is indicated by the name, demonstrates the proper management of an entire farming enterprise as a unit.

This form of demonstration has gained tremendous popularity, for farmers are realising to an increasing extent that conservation farming, or balanced farming, is in the first place in their own

interest. Numerous applications are being received from farmers offering their farms for this purpose. Others request that specific plans be drafted for their farms, and are prepared to bear all costs in connection with the switch over to a better system of farming.

Like the ordinary demonstration, the whole-farm demonstration is of great value to farmers in the vicinity; in fact, it is difficult to imagine a more convincing form of extension work. In consequence, the number of farms on which such demonstrations were conducted has in the year under review increased from 14 to 25 in spite of the fact that the recently appointed extension officers have not yet had an opportunity to start such demonstrations and that four demonstrations had to be discontinued on account of unavoidable circumstances.

A further 10 farms have already been inspected and approved; these demonstrations will come into operation in the next year. Most of these are situated in conservation areas and they will serve as examples of how the neighbouring farms should be planned and worked under the Soil Conservation Act.

Even in regions not yet proclaimed as soil conservation districts more such demonstration farms will be established and treated in all respects as if they were situated in proclaimed regions, to serve as examples to farmers in the localities concerned. In the case of proclaimed areas the Soil Conservation Committee will select the demonstration farms in collaboration with the Extension Officer, and the respective planning committees for such farms will consist of the farmer (as co-operator), the Extension Officer concerned and one representative each of the regional and sectional head offices.

The actual value of such demonstrations depends on the number of farmers in the area concerned who follow the improved farming system. According to reports and observations as well as the communications received from co-operators, there is not the least doubt that the Division has in these demonstrations an instrument which can convince even the most conservative farmers of the advantages of a sound conservation farming system.

In order, therefore, to turn such demonstrations to the greatest possible advantage farmers' days are from time to time organised on such farms; the object is in future to hold at least one such function annually at each demonstration. During the year under review, 59 farmers' meetings with a total attendance of 2,046 were held at co-operative demonstrations.

The Division intends carrying out a whole-farm demonstration in each ecological region as and when the availability of fertilizer and fencing requirements improves and the field personnel can be strengthened.

The Division wishes gratefully to acknowledge here the work of all co-operators who have carried out valuable work for their fellow farmers as well as for the Department.

G. Publicity.

The extensive use to which the Great Powers have put the cinematograph film, press and radio as valuable instruments in forming public opinion and keeping the public informed during the Second World War, is an indication of the possibilities of these factors in the field of education and enlightenment.

The radio may be less serviceable than films or bulletins as a means of giving advice on a practical applied subject such as agriculture, but it is very useful in that it is the quickest form of notifying

the public of facts which can be briefly and concisely announced. While films are seen by thousands, the radio is listened to by millions.

Bulletins and posters are of enormous value for educational and publicity purposes. We are living in an age of speed, and man (the farmer is no exception) cannot always find the time to peruse long reports.

During the past World War, information officers found that methods of visual teaching gave better results than lectures.

After all, the chief function of the Division of Soil Conservation and Extension is to persuade the farmer to apply the correct farming systems and practices. It is undeniably true, however, that the findings of science are far ahead of their application. In farming, the method of personal contact in which the farmer is advised on his farm by an Extension Officer, was found to be the best.

Films, radio, the press, bulletins and posters are used to expedite, supplement and promote extension work. They prepare the way for further enlightenment in that they keep the farmers' interest going and make him more amenable to advice from the Department. In this way large numbers of farmers can be reached quickly, which leaves Extension Officers more time to visit individual farms and there to give guidance in the application of farming practices according to the peculiar needs of each.

The work of the publicity section of the Division must be regarded in this light. The following is a brief summary of its activities.

Films.—The Division has at its disposal three fully equipped film vans, two of which were completed in July 1947. They are stationed at Pretoria, Bloemfontein and Queenstown, from which centres the Transvaal, the Free State and Natal regions and the eastern Cape Province, respectively, are served. The Division intends buying two more film vans during the coming year, to be stationed at Stellenbosch and Pietermaritzburg.

Two technical officers from each regional office attended a film course in Pretoria in order to qualify themselves for the operation of film vans and projectors in their respective regions.

Films were shown on 44 occasions, mostly in the Transvaal and northern Free State, and these were attended by 7,041 persons. The fact that an average of 160 persons attended each demonstration shows the popularity of this form of extension work.

The Division has obtained gratis a number of suitable films from the Agricultural Department of the U.S.A. There is, however, an urgent need for South African films, but owing to the shortage of staff it was not possible to undertake the production of more than one film during the year. It is hoped that it will be possible during the coming year to make a few colour as well as sound films locally.

Radio.—A successful course, for which 14 senior regional officers and home economics officers entered, was given in collaboration with the South African Broadcasting Corporation, the object of which was to acquaint officers with the requirements in regard to the writing and delivery of radio talks and the preparation of radio programmes. These officers will in turn teach others who take part in radio broadcasts. In the course of the year 55 radio talks were written and broadcast by officers of the Division.

Displays at Exhibitions.—Displays were held at 9 exhibitions; farmers showed real interest.

Press.—A large proportion of the European population of the Union was reached through the news items on the activities of the Division which were regularly handed to the press.

Library.—A divisional library was established and serves to supply regional offices and field personnel with reference books and periodicals.

Publications.—Officers of the Division prepared four articles for *Farming in South Africa*, one for the Press Service and sixteen for other publications.

H. Agricultural Club Work and Land Service.

It is generally accepted that extension work will have more lasting results if an interest in and a love for the conservation and protection of our soil, flora and fauna can be inculcated in rural as well as urban young people at an early age. In the same way the actual problem of soil conservation and reclamation can excite lasting national interest only if it is permanently imprinted upon the youthful mind. Agricultural club work and land service afford the finest opportunity to teach future farmers those improved farming practices which they would not otherwise adopt so readily. Children are impressionable and anxious to learn and to test out new ideas; demonstrating to them creates opportunities to impart much valuable information to their parents.

On account of the numerous other important functions of the Division, the staff can devote only a limited part of their time to this work. Nevertheless, the organization of the clubs was maintained at a high level in certain areas, where ordinary as well as extraordinary meetings were regularly held; all the programmes were of a high standard. The object of the ordinary meetings, which are held monthly, is mainly educational and provision is made in the programmes for talks on matters such as soil conservation, the disadvantages of veld and mountain fires and the dangers of unnoticed surface erosion and of over-grazing.

As a rule, adults are the chief speakers at such meetings, but members of the club themselves speak on various agricultural matters. The programmes are prepared by the committee under the guidance of an adult leader and carried out under the direction of the club chairman. In many cases these meetings are attended by parents. During the year, 569 meetings of this nature were held, with a total attendance of 18,841.

Extraordinary meetings include concerts, prize-giving days, exhibitions and tree-planting days. Here again the object is to develop organizing ability, and at the same time to demonstrate the results achieved. Outstanding in this field were the following :—

- (1) A club exhibition as part of the Riviersonderend District Show. On this occasion a club camp which was attended by over 200 club members from neighbouring centres, was also organised. This gave the opportunity for a prize-giving night which was attended by more than 600 visitors. The club section's entries at this show exceeded 2,000 entries; all the clubs in the area supported the show. Exhibits consisted of needlework, confectionery, sheepskin work, vegetables, calves, horses, tanned skins/hides and articles made of wood, tin, leather, cardboard, etc.

IMPROVEMENT OF FARMING PRACTICES.

- (2) A club exhibition as part of the Swellendam District Show with over 1,100 entries of exceptionally high quality.
- (3) The club exhibition at Wittedrift, near Plettenberg Bay, which also drew several hundred entries.
- (4) The prize-giving day at Lindeshof which was filmed by the Savings Bank Branch of the Department of Posts and Telegraphs. All activities of the agricultural club were filmed and are being used by the Secretary of the Savings Bank Branch as a means of propaganda to illustrate how savings could be earned. This film was made in collaboration with the regional officer, who made sure that it would at the same time be good propaganda for the activities of the Division.
- (5) The camp organised near Stutterheim, C.P., with the object of encouraging town children to become acquainted with the country.

Eleven agricultural club camps were organised during the year, the number of participants being 2,200. In addition to films and demonstrations on a variety of agricultural subjects, the programmes included excursions to cities and farms.

At Vlekpoort a land-service camp was organised for students who, in order to complete the practical part of their course, carried out erosion control work under the direction of officers of the conservation area. The technical part of the programme was very successful and gave great satisfaction to both students and staff.

Four more land-service camps were organised during the year at the following places, viz. Villiers (O.F.S.), Jonkershoek (C.P.), Ermelo (Transvaal) and Rooigrond (Mafeking). The average attendance was 50 club members. Amongst the tasks undertaken were the pruning of approximately 10 morgen of trees, the construction of a mountain road and of contour banks and contour paths, and the planting of trees. In the evening the members received lectures on soil conservation and the part played by afforestation. The students were drawn from all branches of study and came from various parts of the country.

During the year, extension officers carried out 1,002 inspections on farms where projects had been completed and gave 165 lectures and demonstrations which were attended by 15,641 children, teachers and parents. A total of 3,199 boys and girls from 135 agricultural clubs carried out individual projects.

I. Home Economics.

Without extension work in this field, the attempts of the Division to put the farming industry on a sound basis would be one-sided, since the contribution of the farmer's wife in the form of good housekeeping is indispensable for the maintenance of a healthy, happy and contented rural population.

Steps, were therefore, taken to extend this service.

For the efficient organization of this work, a Regional Home Economics Officer was appointed at the regional office in addition to the co-ordinating staff at the head office of the Division. Furthermore, with a view to intensifying the work, this service was completely decentralised. Whereas in the past Home Economics Officers travelled long distances from central points and had to confine themselves chiefly to the giving of demonstrations and lectures to womens'

Review of the Union's Dairy Industry.

B. W. Sutton, Superintendent of the Division of Dairying.

THE year under review has in many respects followed closely the climatic conditions and trends in production of the preceding year, and the dairy industry, as well as production generally, has thus suffered from three successive adverse seasons, from a rainfall point of view. The effects of such conditions are usually cumulative and whereas a serious drop in production could have been expected this year as compared with last year, such has in fact not been the case, and the production of both butter and cheese was maintained on more or less the same level. The demand for fresh milk for consumption as such in the large centres of population has not by any means diminished, and the extreme anxiety of dairy farmers to participate in this market has, if anything, greatly increased.

The effect of this has been the diversion to the fresh-milk trade of milk supplies that formerly went to the condensing industry, and to some extent of supplies that went to the cheese factories and the creameries. This has resulted in far less condensed milk being manufactured, particularly in Natal and East Griqualand, so much so that the supply of condensed milk did not anything like meet the demand, and steps had to be taken to divert as much milk as possible to the condensed milk industry, on a purely voluntary basis. With this move on the part of many farmers who previously supplied industrial milk, and many who did not specialize in dairy farming, it was obvious that the time must come, with the onset of the warmer weather and the flush period, that fresh milk would be in oversupply. Towards the end of the period under review this actually happened and quotas have had to be applied. Much of the surplus milk has been diverted to the condensed milk and milk-powder factories, and as far as these factories in the Transvaal and northern Orange Free State are concerned, they are not finding it easy to cope with the greatly increased milk intakes. As far as Natal and East Griqualand are concerned, it has been comparatively easy to divert supplies back to the condensed milk factories and cheese factories. In the western Cape Province the surplus problem hardly intrudes because this is a winter-rainfall area. In the eastern Cape Province the position in regard to surplus supplies is more difficult, for these generally have to be diverted back in the form of cream to the creameries, and unfortunately in many cases it is difficult to arrange for supplies to be diverted direct to the factories, thus saving in railage charges and possibly souring in the hot season.

This year again early rains did not materialize, except in certain areas, and it was only late in the summer that good soaking rains were experienced. These very quickly resulted in increased production and the optimum months of production were January to April, 1947. Good autumn rains were experienced, which allowed the industry to maintain production on a satisfactory level through the winter months. The western Cape Province experienced good rains during the winter.

Fortunately a large stock of butter and reasonable stocks of cheese were accumulated in order to see the country through the winter of 1947, and at the end of the period under review the stock position was reasonably healthy. It was unnecessary for the Dairy

REVIEW OF THE UNION'S DAIRY INDUSTRY.

Industry Control Board to reduce quotas below 50 per cent. at any period and it is trusted that, with a reasonably good season, the consumers will not have to suffer shortages in following years in the same way as they have had to do during the past few years. In December 1946 the prohibition on the disposal of cream was lifted because control of disposal became well-nigh impossible, and taking all circumstances into consideration it was considered advisable to remove this restriction.

The subsequent production of creamery butter seems to indicate that the removal of the prohibition has made little difference to intakes of cream at creameries.

The price of concentrates is still very high, but owing to the much improved maize crop, mixtures have been readily obtainable. The fertilizer position has also improved, and, no doubt, has had some influence in allowing dairy farmers to grow more green fodder, ensilage, etc. Protein feeds are still scarce, but there has been a greater supply of good lucerne hay and, with good root and fodder crops, the position of the feeder has eased materially.

A considerable quantity of white cheese and cream cheese has been made. This is a very valuable food with a high protein value and with its high lactic acid content is particularly recommended for people suffering from digestive troubles. Moreover, it is a valuable spread, compensating to some extent for shortages of butter.

Increasing attention has been focussed by the health authorities of the large centres and also by others interested, on the question of the pasteurization of fresh-milk supplies in the cause of the prevention of milk-borne diseases, and one local authority has definitely decided on compulsory pasteurization of all fresh-milk supplies. It must be stressed, however, that pasteurization alone is by no means sufficient protection to the public.

The pasteurization process puts a very definite cost on milk handling and distribution, and if it is not effectively preceded and followed up by other measures, it is so much wasted effort. It is probably more essential than ever that scrupulous cleanliness should be observed at all stages, including the production end. Good clean raw milk of low bacterial count and showing freedom from coliform types of organisms means so much the better and safer pasteurized milk.

Butter.

The total production from 49 registered creameries, including one College of Agriculture and the Pretoria University, whose production was small, for the period August 1946 to July 1947 was 33½ million lb. in round figures as against 33¼ million lb. for the previous year. Of this some 28 per cent. was produced in the Orange Free State, 23·4 per cent. in the north-western Cape Province, 22·9 per cent. in the Transvaal, 13·2 per cent. in the eastern Cape Province, 8·8 per cent. in Natal and East Griqualand, and 3·7 per cent. in the western Cape Province.

The production of South-West Africa, Bechuanaland Protectorate and Swaziland, from August 1946 to July 1947, was 7,360,981 lb. as against 7,309,893 lb. for the September-August period last year.

Unfortunately very small stocks were carried over from the winter of 1946 to the summer of 1946, so that a strenuous attempt had to be made to build up a strong stock position before the winter of 1947.

Butterfat purchased by Union factories was graded as follows:—

1st grade.....	93.1
2nd grade.....	6.2
3rd grade.....	0.7

Some of this cream may sometimes have to be held back for various reasons, and it speaks well for the standard of grading and the attention in handling to find that the receipts of cream as graded were manufactured into butter of the following qualities:—

1st grade.....	91.5
2nd grade.....	7.6
3rd grade.....	0.9

The average overrun for all 49 creameries was 21.14 per cent. which is satisfactory and 0.34 per cent. better than last year.

As much check-testing of cream as possible was carried out by the Division's technical officers. Samples of cream are taken from cans in transit from the farmer to the creamery and this work is done without the knowledge of the creamery concerned.

On the whole, the results show that the testing work carried out by the creameries is carefully and fairly done. Minor discrepancies do occur from time to time, but small differences must be expected.

All creamery butter has to be graded before it is sold to the consumer, and some 32,904,676 lb. of creamery butter were graded by officers of the Dairy Division during the period September 1946 to August 1947, of which 29,748,534 lb. were presented as 1st grade. Altogether 29,341,544 lb. were passed in its grade, while 389,490 lb. were degraded to 2nd and 17,500 lb. to 3rd; or expressed in percentages, 98.63 per cent. passed as 1st, 1.31 per cent. was degraded to 2nd grade, and 0.06 per cent. to 3rd grade. Of 2,846,676 lb. presented as 2nd grade by the creameries, 2,814,183 lb. passed as 2nd grade, and 32,493 lb. was degraded to 3rd grade; or expressed in percentages, 98.86 per cent. passed in its grade, and 1.14 per cent. was degraded to 3rd. The 307,716 lb. of butter presented as 3rd grade, all passed in that grade.

These gradings are satisfactory and show an improvement on the previous year's results. It would seem to show that efficiency has improved in our creameries and that the grading of the cream, though still on the lenient side, was done with greater care.

The consumption of butter for the period was 37,899,000 lb., including the quantity supplied as ships' stores and to neighbouring territories.

Rationing at 60 per cent. held for September 1946 until on the 30th it was reduced to 40 per cent. On the 23rd December 1946 the quota was raised to 60 per cent. On the 26th May 1947 it was again decreased to 50 per cent. and remained at the figure to the end of the period under review.

The figures for butter production do not include farm dairy butter or farm butter. It is impossible to arrive at a figure for the latter, but farm dairy butter to the amount of 1,602,680 lb. paid levy.

With the fixing of maximum prices for farm-produced butter and on account of the attractive winter premiums for butterfat received by creameries, the tendency is for farm buttermakers to change over to supplying to the creameries.

Cheese.

The production of factory cheese for the period August 1946 to July 1947 was just on 15 million lb., i.e. an amount very slightly

REVIEW OF THE UNION'S DAIRY INDUSTRY.

in excess of last year's production. Close on 200,000 lb. of a special variety of blue-green mould cheese was made and a little over 1½ million lb. of process cheese. A quantity of 165,492,647 lb. of milk or 16,145,624 gallons went into the manufacture of 16,056,764 lb. of green cheese (Cheddar and Gouda), 12,105,056 gallons into Cheddar, and 4,040,568 gallons into Gouda. The average yield of Cheddar was 0·979 lb. of green cheese per gallon of milk on the basis of 10·25 lb., and the yield of Gouda 1·04 lb. of green cheese per gallon of milk on the same basis.

Cheddar and Gouda cheese were produced from August 1946 to July 1947 in the different areas in the Union in the following proportions:—

O.F.S.....	30·85	} 99·97%
Cape Eastern.....	25·33	
East Griqualand and Natal.....	18·47	
Cape (North-west).....	15·00	
Cape (Western Province).....	8·31	
Transvaal.....	2·01	

The fall in the East Griqualand and Natal production shows what serious inroads into the cheese industry were made by diversions of milk to the fresh-milk trade in Durban and Pietermaritzburg, and by the diversion of milk for condensing purposes.

Of the 10,000 lb. of Cheddar cheese graded by officers of this Division, some 83 per cent. was graded as 1st grade, 15·2 per cent. as 2nd, 1·6 per cent. as 3rd grade, and 0·1 per cent. as undergrade. These results are not quite as good as those for last year. The quality seems to have slipped back somewhat, due partly to the diversion of milk supplies and the lack of continuity of manufacturing methods. The 3½ million lb. of Gouda cheese were graded by officers of the Division as follows:— 75·3 per cent. first grade, 24·69 ungraded, and 0·01 per cent. undergrade. These results are a slight improvement on the previous year's gradings. There is still considerable room for improvement in the quality of Gouda cheese, but to-day the Union is producing a Gouda cheese of far better quality than during past years, and some of the Gouda cheese is of first-rate quality, being quite comparable with the overseas product. The production of cheese nowhere like met the demand and it was necessary to ration cheese in a similar way to butter. It is difficult to accumulate stocks of cheese because cheese takes time to ripen or mature and is usually stored at the cheese factories and not in central cold stores. Rationing was on the basis of 70 per cent. during September 1946, until on the 18th November the basis was reduced to 50 per cent. On February 27th, 1947, it was raised to 60 per cent. and remained at this quota to the end of the period under review. There have been no imports of Gouda and Cheddar cheese, but small importations of Edam cheese from Holland have entered the Union. The prices are, however, too high to commend this cheese to the ordinary consumer. Most of it is of a quality containing less than 45 per cent. butterfat in the dry matter, and has to be labelled as skim-milk cheese.

A certain quantity of process cheese and what are known as cheese spreads have been imported, but the quantities were negligible. Farm-produced cheese sold amounted to 201,522 lb.

Condensed Milk and Milk Powder.

It has been mentioned that large quantities of milk that would normally have gone to the condensed milk factories, were diverted to the fresh-milk trade because of the more attractive prices offered,

and this necessarily meant a drop in the production of condensed milk. However, it would seem that a great deal of the flow has been diverted back to the condensed milk factories, and a considerable improvement in the output of condensed milk seems to be indicated. It would appear that the demand for skim-milk powder has seriously declined and at present there is a considerable surplus, proving difficult to sell.

It is quite possible that roller process whole-milk powder may also become surplus if production mounts. It was hoped that quantities of this powder would be absorbed by the various school feeding schemes, which are under the control of Provincial Education Departments, but so far hopes have not been fulfilled.

During the war years the United States of America strongly fostered and developed the production of milk powder and now would seem to be anxious to find overseas markets as an outlet for the surplus, and already supplies have been imported into the Union. For some time large quantities of spray powder have been imported into the Union from the United States of America, but the retail price is very high as compared with the Union product. When reconstituted milk is made from this imported powder the cost is something above 8d. per pint of reconstituted milk, i.e. a good deal higher than that of retail fresh milk.

Other Dairy Products and By-Products.

Despite the considerable advancement of recent years in dealing with what in the earlier days was a sad waste of dairy by-products remaining over after the manufacture of butter and cheese, there is still room for greater efforts to be made in the sound utilization of these one-time waste products.

It is possible to recover by-products which can be used in the manufacture of various foods for humans, for calf, pig and poultry rearing, for the manufacture of glues, sizes and even plastics. There is an increasing demand from industry for quantities of high quality crude casein, which is very easily made from separated milk.

In South-West Africa a factory is being established to handle large quantities of raw separated milk curd for manufacture into casein. This industry is also being developed in the Union, but at a rather slower tempo. It is hoped to develop this side of our Union industry a great deal more in the near future, and improved manufacturing methods are being considered and tried out.

Herd Recording.

Despite the very large and increasing demand on the part of pedigree breeders and of dairy farmers breeding grade herds for this service, it is not possible to develop herd recording to its full extent, because of the difficulty in obtaining staff.

The 36 recorders on the staff averaged 22 testing days each month, which can be considered a very good working unit, as considerable time is taken up in travelling between farms. This usually involves a good deal of train travelling, though it is hoped in time to concentrate rounds a great deal more and thus be in a position to increase the number of testing days. During August 1947, altogether 3,321 registered cows and 6,701 grade cows were tested, i.e. a total of 10,222 cows as compared with a total of 9,176 in August 1946.

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The herds tested during August 1947 were distributed over the various areas as indicated in the following table:—

Distribution of Herds Tested.

Area.	Herds.			Cows.	
	Registered.	Grade.	Mixed.	Registered.	Grade.
Cape Western.....	51	42	23	857	1,143
Cape Eastern.....	79	16	25	1,163	836
O.F.S.....	39	38	30	537	1,305
Natal.....	18	66	19	326	2,682
Transvaal.....	17	9	11	438	735
UNION OF SOUTH AFRICA.....	208	171	108	3,321	6,701

And the following table indicates the average number of herds and cows tested per month in the different areas of the Union during the 12 months under review:—

*Distribution of Average Number of Herds Tested per month.—
1 September 1946 to 31 August 1947.*

AREA.	Herds.			Cows.	
	Registered.	Grade.	Mixed.	Registered.	Grade.
Cape Western.....	47	38	22	815	1,271
Cape Eastern.....	75	10	18	1,008	468
O.F.S.....	41	41	19	523	1,031
Natal.....	19	61	15	430	2,304
Transvaal.....	24	15	19	623	1,234
Union of S.A.....	206	165	93	3,399	6,338

Where requested, individual registered cows were also tested for the solids-not-fat content of the milk.

Good grade dairy cows are still being bought up, chiefly from the Orange Free State and East Griqualand, to go into dairy herds being run near the large centres. Some of the best producers are thus lost to the farmers.

Unfortunately most of the heifer calves are lost to the country because at the ruling prices for fresh milk it is not economical to raise these calves. Thus the country loses many of its potentially best dairy cows of the future. The loss to the rural areas of the best producers also entails a loss of milk to the cheese factories, etc., established in those areas.

The average production of the various registered dairy breeds has been calculated for the areas served by the different provincial officers, and the distribution of the various registered dairy breeds tested and the average productions during the period September 1945 to 31 August 1946, are shown in table I.

TABLE I.—AVERAGE PRODUCTION OF REGISTERED COWS WHICH COMPLETED A LACTATION OF 270-300 DAYS DURING THE PERIOD 1ST SEPTEMBER 1945 TO 31ST AUGUST, 1946.

AGE CLASSIFICATION.		2 YEARS.			JUNIOR 3.			SENIOR 3.			JUNIOR 4.			SENIOR 4.			MATURE.		
Area where tested.		No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.
<i>A.—Ayrshire.</i>																			
Cape Western 1944-45.		1	6,994	236.3	3	6,451	230.1	2	4,949	183.2	5	8,210	293.0	1	4,880	137.1	17	9,564	323.4
1945-46.		8	6,135	221.4	4	6,044	215.4	1	6,654	230.2	3	6,139	232.8	2	8,260	291.5	20	9,163	309.8
Cape Eastern 1944-45.		6	6,168	230.1	1	9,400	339.3	1	7,731	238.6	3	7,741	235.3	1	10,415	397.2	11	9,412	351.5
1945-46.		8	6,478	253.2	—	—	—	3	9,023	343.4	2	6,331	233.4	5	7,472	292.7	20	8,397	329.3
Natal 1944-45.		1	7,300	275.5	2	6,179	287.7	3	6,555	243.8	2	9,254	318.7	3	5,976	266.6	20	7,100	285.5
1945-46.		4	4,661	203.1	9	5,142	215.5	6	5,688	229.4	5	7,161	278.7	2	8,531	325.6	35	7,677	301.6
Transvaal 1944-45.		1	8,829	349.6	6	9,085	329.9	4	10,339	363.1	1	6,821	279.9	1	10,560	357.1	16	9,683	378.0
1945-46.		7	8,103	318.2	12	8,624	335.7	2	10,155	403.9	3	10,940	410.4	5	12,215	472.8	17	11,261	447.8
Union of S.A. 1944-45.		9	6,681	249.1	12	7,963	295.3	10	7,865	283.9	11	7,964	294.4	6	7,297	231.8	64	8,795	330.0
1945-46.		27	6,529	253.2	25	6,958	273.2	12	7,347	289.1	13	7,670	291.5	14	9,430	361.6	92	8,820	336.4
Union of S.A.		112 cows; 8,291.6 lbs. milk; 309.593 lbs. butterfat; 3.784 % butterfat; 300 days.																	
All ages 1945-46.		183 cows; 8,095.8 lbs. milk; 311.143 lbs. butterfat; 3.843 % butterfat; 295 days.																	
<i>B.—Brown Swiss.</i>																			
Cape Eastern 1944-45.		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1945-46.		4	5,840	248.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Orange Free State 1944-45.		2	10,053	406.1	2	8,652	314.9	—	—	—	2	12,192	414.2	1	8,431	364.7	4	11,225	409.7
1945-46.		1	9,721	375.7	—	—	—	—	—	—	—	—	—	—	11,101	460.8	11	11,967	466.5
Union of S.A. 1944-45.		2	10,063	406.1	2	8,652	314.9	2	8,017	307.4	—	—	—	2	7,979	337.5	6	11,159	416.4
1945-46.		5	6,610	274.1	—	—	—	—	—	—	2	12,192	414.2	1	11,101	460.8	14	11,353	443.1
Union of S.A.		14 cows; 9,738.5 lbs. milk; 373.592 lbs. butterfat; 3.836 % butterfat; 300 days.																	
All ages 1945-46.		22 cows; 10,341.0 lbs. milk; 402.852 lbs. butterfat; 3.896 % butterfat; 297 days.																	

REVIEW OF THE UNION'S DAIRY INDUSTRY.

TABLE I—(Continued).—AVERAGE PRODUCTION OF REGISTERED COWS WHICH COMPLETED A LACTATION OF 270-300 DAYS DURING THE PERIOD 1ST SEPTEMBER 1945 TO 31ST AUGUST, 1946.

AGE CLASSIFICATION.	2 YEARS.				JUNIOR 2.				SENIOR 3.				JUNIOR 4.				SENIOR 4.				MATURE.			
	No. of cows.	Milk.	B.F.	No. of cows.	No. of cows.	Milk.	B.F.	No. of cows.	No. of cows.	Milk.	B.F.	No. of cows.	No. of cows.	Milk.	B.F.	No. of cows.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	No. of cows.
<i>C.—Friesland.</i>																								
Cape Western 1944-45.....	58	8,608	312.2	29	9,688	347.7	346.5	28	10,090	392.1	392.1	37	9,758	347.7	347.7	34	11,196	403.5	403.5	135	11,740	404.6	404.6	135
1945-46.....	86	9,027	337.9	44	9,338	346.5	346.5	35	10,717	412.6	412.6	30	11,516	416.5	416.5	36	11,819	430.0	430.0	144	10,687	386.8	386.8	144
Cape Eastern 1944-45.....	159	9,487	358.9	66	9,671	363.5	363.5	60	11,348	417.0	417.0	63	11,751	441.9	441.9	54	12,611	477.7	477.7	236	10,587	380.5	380.5	236
1945-46.....	173	9,225	346.2	64	9,761	364.1	364.1	59	10,452	398.5	398.5	57	11,086	441.6	441.6	54	12,611	477.7	477.7	243	12,198	440.9	440.9	243
Orange Free State 1944-45.....	84	8,520	316.2	50	9,220	341.4	341.4	44	10,243	378.5	378.5	33	9,868	368.7	368.7	37	11,178	404.9	404.9	173	11,545	417.5	417.5	173
1945-46.....	93	8,627	316.7	38	8,755	320.3	320.3	35	10,154	378.5	378.5	43	9,842	355.3	355.3	26	10,944	395.7	395.7	216	11,186	399.1	399.1	216
Natal 1944-45.....	36	8,132	300.4	32	7,530	274.9	274.9	31	8,045	295.1	295.1	35	8,977	327.1	327.1	26	8,804	328.6	328.6	167	9,444	395.1	395.1	167
1945-46.....	52	7,292	280.6	33	8,356	312.8	312.8	27	8,922	338.4	338.4	26	9,688	359.7	359.7	16	9,799	366.3	366.3	177	9,837	366.1	366.1	177
Transvaal 1944-45.....	101	9,149	336.3	44	9,408	341.8	341.8	39	10,503	378.4	378.4	45	10,499	386.4	386.4	24	11,075	400.4	400.4	188	11,275	405.7	405.7	188
1945-46.....	91	9,153	340.9	45	9,785	362.6	362.6	55	10,807	395.9	395.9	42	10,493	379.9	379.9	41	11,393	415.5	415.5	232	11,319	409.7	409.7	232
Union of S.A. 1944-45.....	438	8,938	334.5	211	9,288	342.3	342.3	202	10,235	374.5	374.5	213	10,393	383.3	383.3	175	11,270	415.1	415.1	949	10,846	401.3	401.3	949
1945-46.....	495	8,862	331.4	224	9,305	345.4	345.4	221	10,335	388.7	388.7	193	10,514	386.6	386.6	184	11,123	408.0	408.0	1,017	11,137	405.4	405.4	1,017
<i>Union of S.A.</i>																								
All ages 1944-45.....	2,188 cows	10,261.9 lbs. milk	379.103 lbs. butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat	3 694 % butterfat
1945-46.....	2,339 cows	10,350.9 lbs. milk	381.029 lbs. butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat	3 681 % butterfat
<i>D.—Guernsey.</i>																								
Cape Western 1944-45.....	1	6,572	259.9	—	—	—	—	3	7,220	310.4	310.4	1	8,377	310.8	310.8	1	8,423	360.1	360.1	3	6,429	305.4	305.4	3
1945-46.....	10	7,110	345.8	2	10,551	494.3	494.3	4	7,844	364.0	364.0	5	9,711	474.0	474.0	—	—	—	—	10	10,243	480.9	480.9	10
Cape Eastern 1944-45.....	6	10,871	509.5	2	8,975	436.7	436.7	1	10,151	528.8	528.8	—	—	—	—	1	11,785	511.3	511.3	1	12,088	535.4	535.4	1
1945-46.....	1	8,955	408.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	7,926	372.9	372.9	2
Orange Free State 1944-45.....	17	8,439	398.0	5	9,156	433.5	433.5	7	7,462	341.1	341.1	6	9,459	446.8	446.8	—	—	—	—	15	9,492	440.9	440.9	15
1945-46.....	14	7,397	355.4	6	7,865	385.4	385.4	9	8,244	392.5	392.5	6	8,694	432.8	432.8	2	10,104	435.7	435.7	29	8,780	411.1	411.1	29
<i>Union of S.A.</i>																								
All ages 1944-45.....	50 cows	8,816 lbs. milk	412.3 lbs. butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat	4.677 % butterfat
1945-46.....	66 cows	8,363 lbs. milk	397.1 lbs. butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat	4.749 % butterfat

TABLE I—(Contd.)—AVERAGE PRODUCTION OF REGISTERED COWS WHICH COMPLETED A LACTATION OF 270-300 DAYS DURING THE PERIOD 1ST SEPTEMBER 1945 to 31ST AUGUST, 1946.

AGE CLASSIFICATION.	2 YEARS.			JUNIOR 3.			SENIOR 3.			JUNIOR 4.			SENIOR 4.			MATURE.		
	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.	No. of cows.	Milk.	B.F.
<i>E.—Red Polls.</i>																		
Cape Eastern 1944-45.....	3	6,274	231.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1945-46.....	8	4,985	179.3	2	5,125	208.8	2	5,486	211.7	2	6,588	229.9	5	6,184	244.5	17	7,782	296.2
Union of S.A. 1944-45.....	3	6,274	231.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1945-46.....	8	4,985	179.3	2	5,125	208.8	2	5,486	211.7	2	6,588	229.9	5	6,184	244.5	17	7,782	296.2
<i>Union of S.A.—</i>																		
All ages 1944-45.....	42	27 cows ; 7,198.6 lbs. milk ; 268.185 lbs. butterfat ; 3.726 % butterfat ; 300 days.		42	27 cows ; 6,526.8 lbs. milk ; 243.210 lbs. butterfat ; 3.726 % butterfat ; 299 days.													
1945-46.....																		
<i>F.—Shorthorns.</i>																		
Cape Eastern 1944-45.....	32	5,061	242.0	10	8,216	338.6	7	6,444	252.9	8	8,635	340.0	2	6,067	253.6	34	8,094	318.6
1945-46.....	37	6,010	236.9	14	7,315	294.3	8	5,948	240.2	11	7,426	298.0	7	8,122	336.9	36	7,171	294.9
Orange Free State 1944-45.....	9	5,552	232.4	3	5,851	241.9	5	6,220	247.4	4	5,988	249.2	3	5,011	200.5	15	6,636	272.8
1945-46.....	2	5,679	233.6	5	5,229	194.2	8	6,241	253.1	8	5,388	212.3	8	6,577	256.0	34	6,294	249.1
Natal 1944-45.....	—	—	—	—	—	—	1	5,308	186.6	6	6,418	232.9	2	6,334	239.1	11	6,375	239.5
1945-46.....	3	3,618	141.5	4	4,479	173.7	4	5,075	221.1	2	5,625	225.2	2	6,739	272.7	16	6,142	231.6
Transvaal 1944-45.....	—	—	—	1	9,235	352.8	—	—	—	—	—	—	—	—	—	1	8,992	313.5
1945-46.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Union of S.A. 1944-45.....	41	5,871	237.7	14	7,782	318.9	16	6,261	246.0	18	7,297	296.8	7	5,862	226.7	61	7,438	292.9
1945-46.....	42	5,823	229.9	23	6,368	251.6	17	5,970	245.4	21	6,478	259.4	17	7,232	291.3	86	6,640	290.8
<i>Union of S.A.—</i>																		
All ages 1944-45.....																		
1945-46.....																		

157 cows ; 6,980.5 lbs. milk ; 272.371 lbs. butterfat ; 3.902 % butterfat ; 300 days.
206 cows ; 6,420.1 lbs. milk ; 252.483 lbs. butterfat ; 3.964 % butterfat ; 295 days.

REVIEW OF THE UNION'S DAIRY INDUSTRY.

TABLE I.—(Contd.).—AVERAGE PRODUCTION OF REGISTERED COWS WHICH COMPLETED A LACTATION OF 270-300 DAYS DURING THE PERIOD 1ST SEPTEMBER 1945 to 31ST AUGUST, 1946.

[illegible]

Staff Activities.

The following is a statement of certain duties performed by officers of the Division.

Farms visited during the year in connection with herd recording	334
Farms visited for the purpose of rendering other services.....	687
Visits of inspection to creameries.....	1,286
Visits of inspection to cheese factories.....	1,073
Visits of inspection to other.....	1,801
Farmers meetings attended.....	393
Judging at Agricultural shows.....	15
Butter samples tested for moisture.....	239
Examinations in Milk Testing.....	117
Examinations in Cream Testing.....	68
Examinations in Cream Grading.....	41
Examinations in Cheesemaking.....	45
Articles submitted for publication.....	13
Cans of cream sampled in transit, graded and tested subsequently.....	1,325
Cans of cream graded and checked at creameries.....	6,130

In July 1947 the former Superintendent of Dairying Mr. L. J. Veenstra retired on superannuation. He was head of the Division during a very trying period, but through his energy and keenness he assisted in steering the Division and the dairy industry through very difficult days. He was succeeded by the present Superintendent.

The Business Aspect of Farming :—

[Continued from page 1009.]

Food Control.

During the year the branch offices were still responsible for extensive activities on behalf of the Food Control Organization. With the exception of Johannesburg, the officers in charge of the Divisional Offices in the nine principal cities of the Union were also the local Officers-in-Charge for the Food Directorate. This has now been changed, however, and remains in force only in the case of Port Elizabeth and Pietermaritzburg.

All eggs bought for cold storage purposes and for military camps were inspected by officers of the branch offices. Towards the end of 1946, however, purchases for military camps were discontinued.

Where potatoes were exported, officers of the Division were responsible for the inspection—both inland and at the docks—as well as for shipping.

The following figures show the extent of the work carried out in connection with purchases for the distribution scheme and military camps in Johannesburg only :—

Potatoes.....	13,049 bags
Eggs.....	10,185 boxes
Vegetables.....	50,890 lb.
Fruit.....	30,870 lb.

Price Control.

In order to ensure compliance with the price control regulations in respect of eggs, potatoes, vegetables and fruit in the retail trade, officers of the Division regularly assist the inspectors of the Price Controller in their rounds among retail dealers.

Research in Agricultural Problems.

Prof. H. B. Davel, Director of the Agricultural Research Institute, Pretoria.

During the past year the activities of the Agricultural Research Institute were continued under difficult circumstances. From an agricultural point of view, it was a bad year. From month to month the rainfall was below normal and much lower than in previous years; consequently the crops were poor. The unfavourable conditions, accompanied by a shortage of artificial fertilizer which was available only in very limited quantities during the war years and could be used only for the cultivation of a portion of the maize, was responsible for decreased yields. In fact, the annual bean and hay yields progressively decreased, owing to the shortage of fertilizer and even the subsequent maize yields declined. The average maize production for the year was only 14.5 bags per morgen, i.e. approximately 5 bags per morgen less than previously. During the year 850 bags of maize, 286 tons of silage and 150 tons of hay were produced. A considerable quantity of veld hay, used for the feeding of oxen, was harvested.

Good progress was made with the establishment of the Afrikaner herd and the first calves of the bull Zwavelfontein Unie are particularly promising. The old Afrikaner herd was transferred from the Athole Experiment Station, Ermelo, to the Mara experiment Station where the climate and grazing are more suitable for the breed. As a breeding and educational requirement, a number of the best young heifers will annually be transferred from Mara to Pretoria in order to establish a larger herd in Pretoria.

In regard to the Friesland herd, the position was less satisfactory, mainly because comparatively few heifer calves and mostly bull calves were born. Arrangements are being made, however, for the purchase of a number of young heifers for breeding with the bull Brakfontein de Beste Melkman. This bull has already proved that he is a valuable animal from a breeding point of view.

It must be emphasized that the Friesland herd of the Institute is of a particularly high quality and that the Institution will most probably be able to provide valuable services in future by making stud animals of a high standard available to breeders. This year approximately 8 or 10 young bulls of outstanding quality will be offered for transfer or for sale.

During the past year considerable attention was paid to the breeding of Large White pigs and it may be freely stated that excellent results were obtained. The herds are more uniform than formerly and the standard attained is extremely promising. This improvement is largely due to the imported Large White boar and two sows. A number of the piglets were sent to other experiment stations, and sold to breeders for breeding purposes.

Education.

The following numbers of students are enrolled in the faculty of Agriculture and Agricultural Engineering:—

B.Sc. (Agric.) I.....	78	
B.Sc. (Agric.) II.....	47	
B.Sc. (Agric.) III.....	16	
B.Sc. (Agric.) IV.....	23	
	<hr/>	164
B.Sc. (Agric.) Eng. I.....	11	
B.Sc. (Agric.) Eng. II.....	7	
B.Sc. (Agric.) Eng. III.....	3	
B.Sc. (Agric.) Eng. IV.....	3	
	<hr/>	24
M.Sc. (Agric.).....	11	
D.Sc. (Agric.).....	7	
	<hr/>	18
Diploma (Soil and Veld Conservation).....	2	2
TOTAL.....		<hr/> 208

The following degrees were awarded in 1947:—

Hon. D.Sc. (Agric.), (Prof. A. M. Bosman).....	1
D.Sc. (Agric.).....	1
M.Sc. (Agric.).....	2
M.Sc. (Agric. Eng.).....	1
B.Sc. (Agric.).....	8
B.Sc. (Agric. Eng.).....	2
TOTAL.....	<hr/> 15

Research.

The activities of the various departments were as follows:—

Agronomy.

The major portion of agronomic research consists of long-term field experiments in connection with crop production under dry land conditions and under irrigation.

(a) Fertilizer experiments with maize cultivated continuously on the same experiment plots since 1929-30, indicate that, as before, superphosphate is the most important of the fertilizers concerned. No significant results were obtained from the use of various fertilizers containing nitrogen and potash. In fact, the application of potash exerted a depressing effect of a significant nature on the maize yields. The studies on the use of fertilizers for maize cultivated in rotation with legume and non-legume hay crops, proved that nitrogen and potash produced a small, yet significant increase in the maize crop. The results of these crop-rotation and fertilizer experiments have already been statistically analysed and elaborated and will shortly be published in the form of a pamphlet.

(b) (i) Experiments on the ploughing in of crop residues, particulars of which have been published, are being continued, as also experiments on the utilization of babala in rotation with maize, as grazing, silage and for green manuring. Babala is giving good results in the rotational cropping system.

(ii) In the rotation experiments with maize, a comparison of the system which includes the establishment of Rhodes grass for three years, with that which includes cowpeas, reveals not only that Rhodes grass is a useful crop in the rotational system, but also that the

RESEARCH IN AGRICULTURAL PROBLEMS.

beneficial effect on the subsequent maize crops is greater and more stable than the residual effect of cowpeas.

(c) The Unit experiments have completed an eight-year cycle and the data for the first seven seasons, including the 1945-46 season, have been analysed and are being prepared for publication. It was found that the average carrying capacity of the 15 morgen of cultivated soil used in this experiment, calculated on a basis of home-grown feeds over the period of seven seasons, amounted to 8.70 cows, each producing 2.75 gallons of milk per day during the lactation period. The annual average milk production was 6,625 gallons of milk or 442 gallons per morgen. The experiment also furnished valuable data in respect of the use of a perennial grass (Rhodes grass) in rotation with annual crops. It has been proved that it is possible to obtain high yields by means of cultivation methods so planned as to ensure protection to the cultivated soil, while at the same time maintaining its fertility and structure at a high level. Thus, the experiment has not only furnished useful quantitative data, but has also served as a valuable guide in the technique to be followed in the study of methods of soil utilization.

(d) The irrigation experiments were continued and fifteen successive crops have already been obtained. The results indicate that the continuous use of ammonium sulphate without the addition of agricultural lime, increases soil acidity which is accompanied by the leaching of bases from the soil and consequently has a detrimental effect on the wheat crop. This aspect was investigated by the department of Agricultural Chemistry.

(e) Unfortunately, streak disease made its appearance in wheat and the degree of infection is increasing annually. The matter is being investigated and it may be necessary to replace the "Rooskleinkoring" variety, which has been cultivated continuously in the experiment since 1939-40, by a variety more resistant to the disease.

(f) Experiments in connection with the use of agricultural lime with inorganic fertilizers and kraal manure were continued. The results obtained during the past season do not differ much from those obtained previously.

(g) The compost experiment which is being carried out on irrigated crops, indicates that wheat straw converted into compost is superior to untreated wheat straw, but not as good as kraal manure, if the applications are made on the basis of the equivalent quantity of combustible dry material as contained in an application of 3 tons of wheat straw per morgen.

(h) The experiments on the use of agricultural lime for dryland crops proved that the lime still had a marked effect during the past season. The lime was applied in various quantities. The benefits of the two tons of lime per morgen are still perceptible.

(i) Studies on the effect of the time of ploughing and the number of ploughings, on a crop in a rotational system, indicated during the past season that there are no significant differences between the single ploughing performed in autumn, winter or spring. Double ploughing performed both in winter and in spring, and in autumn and spring showed a slightly better effect than the single treatment. These experiments have not been in progress long enough to allow of any definite conclusions.

(j) Experiments with dryland lucerne indicated that good yields can be obtained and maintained for at least five years under the prevailing rainfall conditions in Pretoria. The experiments will,

however, be amended to make provision for a more comprehensive study on the inclusion of dryland lucerne in a system of crop rotation with annual crops. A study will be made of the effect of lucerne on the subsequent crops, as well as on the productivity and structure of the soil and on the possible value of lucerne for suppressing weeds, especially nut grass and yellow nut grass.

(k) Studies in connection with run-off and soil erosion on slopes of 3.75 per cent. and 7.00 per cent. were continued. These experiments have been in progress since 1929 and are being statistically analysed with a view to publication.

(l) The long-term experiments in connection with grass-veld utilization and control were continued and one experiment was statistically analysed and the data used in a thesis during December 1946.

(m) A field experiment on the influence of fallowing on the soil moisture figures of cultivated soils was planned and will shortly be commenced.

(n) Other experiments in progress include the residual effect on maize crops of heavy applications of kraal manure and superphosphate once every five years: studies on wide espacement of maize; studies in connection with the mutual competition between Rhodes grass and lucerne; fertilizer studies with reference to ordinary veld, Rhodes grass and Paspalum; and varietal experiments with the improved teff varieties, dried beans and sweet-potato varieties.

Apart from the abovementioned research work, this department is also assisting in the planning of crop cultivation on the experiment farm and in the devising of experiments and statistical elaboration of investigational results of other departments, such as Entomology, Dairying, Horticulture, Animal Husbandry and Agricultural Chemistry.

Agricultural Chemistry.

In connection with the use of nitrogenous fertilizers, so important in irrigation farming, the acidifying action of ammonium sulphate has been thoroughly investigated. At the same time the influence of farm manure and superphosphate on the degree of acidity of the soil was also determined, the fertilizer experiment with wheat under irrigation having been used for this purpose. What led to this investigation was the fact that on the plots fertilized with ammonium sulphate, the young wheat plants were so badly scorched after the experiment had been in progress for only three years, that it was feared that the experiment would prove a failure within a few years owing to the rate of acidification.

An analysis of the soil samples clearly indicated the high degree of acidification. On some plots the ammonium sulphate drove out so many bases from the soil that the pH of its normal value was changed from approximately 6 to almost 4. Fortunately, however, a further study of the results of the analysis revealed that the acidification will not progress much further owing to the number of iron and aluminium compounds in the soil which, at this degree of acidity, are sufficiently soluble to neutralize the acid and cause it to leach without involving too many useful bases.

The experiment clearly reveals, however, that the use of ammonium sulphate can under no circumstances be recommended on the red laterite soils so often found in the northern and eastern regions of the Transvaal and Natal. On this type of soil no fertilizer leaving

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an acid residue should be used; calcium or ammonium nitrate, preferably the former, is the indicated fertilizer for these areas.

As opposed to the general belief that superphosphate acidifies the soil, it was found in this experiment that the annual application of 800 lb. of superphosphate per morgen had no harmful effect on the soil. Actually the soil to which this fertilizer was applied, was less acid than before and these results tally with findings in other parts of the world where the influence of superphosphate on the soil has been thoroughly investigated.

The applications of artificial fertilizer had a very beneficial effect. Apart from the increased yield which one would in any case have expected, the manure enriched the soil with valuable bases. In fact, it appears that manure, at the rate of 7 tons per morgen annually, is an excellent substitute for lime, and that where the two are applied together, the acidifying action of ammonium sulphate is completely eliminated. The fertilizer also noticeably increased the potassium and supplemented other possible deficiencies, e.g. the micro elements.

This department is also engaged in a number of other experiments which, however, have not yet progressed sufficiently to allow of report at this stage. Among others, the following problems are being investigated:—

- (a) The general problem of the utilization of water by farm and veld crops; a number of lysimeters are being used in this investigation.
- (b) The influence of drought on the yield and composition of the crop. A variety of experiments are in progress, in connection with this problem.
- (c) The influence of fertilizers and grazing control on the composition of the grass.
- (d) The humus content of the soil—the influence of cultivation, fertilization, crop rotation and particularly of a grass crop on this factor is being investigated.
- (e) The influence of grass and other crops on nitrification in the soil.
- (f) The fertilizer requirements of ordinary farm crops on dryland and under irrigation as well as of natural and established pastures are being investigated in collaboration with the department of Agronomy.

Animal Husbandry.

Cattle.—The study in connection with the influence of environmental factors on the quantitative and qualitative production of milk was continued.

(a) Under South African farming conditions, the covering of long distances by milch cows, on their way to the veld is often unavoidable. This must necessarily entail a wastage of energy which could otherwise be used for the production of milk. An experiment is in progress to determine the extent of this influence on the production and composition of milk during various seasons of the year. The results obtained during the past winter months indicate that the covering of a distance of $1\frac{1}{2}$ miles twice a day by cows, has no noticeable detrimental effect on milk production.

(b) The study to determine the influence of the month of calving on the yield and composition of milk in various farming areas of the

Union, is being investigated. The results thus far obtained clearly indicate that the monthly variation in the production and composition of milk, together with the curve of the milk graph, reflect the changes and fluctuations which take place under the environmental conditions, most important of which are the natural conditions with regard to feed. The results furnish valuable information for the improvement of the feeding and management of dairy herds in various areas of the Union.

(c) The investigation in connection with the breeding value of Friesland bulls was extended to a comparative study of the breeding results obtained from the same bulls which were first used in Friesland and then exported to South Africa. In this connection the co-operation of the "Friese Rundvee Stamboek Vereniging" at Leeuwarden, Holland, which is responsible for the collection of available data in Holland, is greatly appreciated.

(d) The results of the study in connection with the delimitation of the natural farming areas of South Africa, is being prepared for publication.

Pig Experiments. (a) A study is being made of the comparative suitability of cross-bred (Large White and Large Black) and pure-bred Large White pigs for pork production.

(b) The study also includes an investigation into the effect of various feeding levels on the economics of feed consumption as well as on the quality of the carcasses of porkers.

Sheep Experiments. (a) A study was made of the maintenance and production requirements of various types of sheep by means of individual feeding and digestion experiments. The results determined the following feed requirements per 100 lb. live weight:—

(i) Merino (fine woolled-type) 1.12 lb. T.D.N. (Total digestible nutrients).

(ii) Dorset x Merino (woolled-type mutton sheep) 1.07 lb. T.D.N.

(iii) Dorset x Persian (non-woolled type mutton sheep) 1.00 lb. T.D.N.

(iv) Blackhead Persian (non-woolled fat-tailed type) 0.96 lb. T.D.N.

(b) The influence of environmental temperatures on the efficiency of feed consumption was also determined in connection with this experiment.

(c) The investigation in connection with the production of fat lambs was continued. The results obtained are being used for a score card for the judging of lamb and mutton carcasses.

(d) The breeding of a non-woolled mutton breed for the western grassveld areas is progressing favourably.

Veterinary Science.

(a) Work on the *antigenic value* of Salmonellas is being continued.

(b) *Paratyphoid in calves.*—The new alum hydroxide adsorbed vaccine largely eliminates shock.

(c) *Abortion in mares.*—During the past year one publication appeared on this problem. From observations during the past two years, it is clear that these abortions are caused by nutritional disturbances and a virus.

(d) *Milk hygiene*.—The occurrence of tubercular germs in various samples from city milk supplies was established.

Genetics.

Maize.—The following experiments are in progress:—

- (a) *Yellow maize variety*.—Further progress was made with the breeding of a yellow maize variety showing great similarity to the Early Potchefstroom Pearl.
- (b) *Streak disease*.—In a test on thirteen different maize varieties with regard to resistance to streak disease, the varieties Sahara, Hickory King and American Flint gave the highest yields. The highest yield was obtained from Sahara with 16.3 and the lowest from Boesman with 9 bags per morgen. The experiment was carried out on a land severely infested with nut grass. This test indicated that streak-disease infection is particularly severe early in the season and if reliable results are to be obtained in regard to the relative resistance of varieties to this disease, planting must be carried out as early as possible. For this reason further experimental work is being planned accordingly. The purpose of this experiment is to breed maize varieties which will be resistant to this disease, in order that maize cultivation may also be possible in areas where at present the occurrence of streak disease makes it uneconomical.
- (c) *Hybrid corn*.—A commencement was made with the in-breeding of maize for the purpose of developing desirable hybrid corn. Special attention is being paid to yellow maize varieties.

Broom sorghums.—Further progress has been made with the breeding of desirable broom sorghums.

Vegetable crops.—Beds of the most important vegetables were maintained principally as a supplement to the laboratory requirements of the Department of Horticulture where the material is required for classing purposes.

Breeding is carried out with the following:—

- (a) *Beans*.—Small quantities of seed from 39 types of field beans and 15 types of runner beans were planted in rows for a study of the general varietal characteristics with a view to subsequent cross-breeding.
- (b) *Marankas*.—Twenty selections were transplanted and in-bred in order to develop desirable types.
- (c) *Onions*.—Further progress was made with the breeding of a very promising selection which has been studied for many years.
- (d) *Cross-pollination*.—An experiment was conducted as a supplement to the breeding work to determine the natural cross-pollination of bean varieties. No final results are available as yet.

Biochemistry.

The interaction between Vitamin D, lactose and finely divided and diluted tricalcium phosphate.—This work is a continuation of the experiment mentioned in last year's report. At that time it was concluded that the absorption of calcium and phosphorus is promoted

not only by the presence of lactose in the commodity "Calcarea phosphorica", but also by the "infinitesimal reduction", of tricalcium phosphate present in the abovementioned preparation.

This year it is proposed to determine the interaction, if any, between vitamin D, lactose and finely divided and diluted tricalcium phosphorous.

The reaction of young growing rats, when fed on various rations, was again studied. The calcium and phosphorous content of the three rations was approximately the same, viz., 0.29 per cent. calcium and 0.32 per cent. phosphorous. Similarly, the lactose content of rations II and III was also kept the same. The only difference in the composition of the three rations was the type of carbohydrate and tricalcium phosphate used.

The various rations were composed as follows:—

Ration I: Ordinary tricalcium phosphate and dextrinated starch.

Ration II: Tricalcium phosphate in the form of "Calcarea phosphorica" which is a very fine dilution of calcium phosphate in lactose; and

Ration III: Ordinary tricalcium phosphate and lactose.

In view of the comprehensive nature of the work and the limited time which has thus far been available, any conclusions would be premature at this stage.

A study in connection with the deficiencies in the Steenbock-Black Rachitic Ration, No. 2965.—The composition of this ration, expressed on a percentage basis, was as follows:—

Yellow mealie meal 76, wheat gluten 20, calcium carbonate 3 and sodium chloride 1.

Owing to the lack of vitamin D and its high calcium: phosphorous relationship, young rats which are fed this ration, develop serious symptoms of rickets within a period of three weeks. When kept on the ration for a longer period, they develop paralysis in the hind-legs by approximately the sixth to the ninth week and their growth is far below that of animals fed in the normal way.

The question therefore arises as to whether apart from the vitamin D deficiency there are not perhaps some further deficiencies which are also responsible for these symptoms.

With the object of gaining further information on this subject, the abovementioned ration was fed to young rats, with and without various additions such as amino acids, phosphate, vitamins D, E, A or the B complex, and a comparative study made of their symptoms. The work is still in progress and no definite conclusions can be drawn at this stage.

Poultry Husbandry.

During the past year various nutritional experiments were carried out and special attention was paid to the influence of high calcium on the growth of chicks and young fowls. The results and conclusions may be briefly summarized as follows:—

(a) High calcium in rations for chicks has a retarding influence on their growth and health.

(b) Pullets fed on rations high in calcium develop various abnormalities such as paralysis, tendency for the feathers to become dry and dull, and sometimes blindness.

On the strength of these results, the following recommendations may be made:—

Chick rations.—If the mash contains from 1·5 to 1·6 per cent. of calcium, extra shell grit should not be fed in separate hoppers to chicks up to the age of 8 weeks.

Pullets and laying hens.—For health, optimum growth and egg production, the mash of pullets should not contain more than 3 per cent. of calcium, i.e. 1·5 per cent. of calcium if equal parts of mash and grain are fed.

It is known that high egg producers need additional calcium for the formation of egg shells, but instead of the addition of a maximum percentage of calcium to the mash ration, the addition of minimum quantities and the feeding of oystershell grit in separate hoppers is recommended in order that the hens may satisfy their own individual requirements (*ad lib*) according to their rate of egg production. In several experiments it was very evident that hens are inclined to eat excessive quantities of calcium if no granite pebbles are available for grinding the food in their stomachs. Oystershell or limestone grit is soft and easily digested and this type of grit is not as effective as granite pebbles for grinding the food. Moreover, granite pebbles also regulate the intake of calcium. In various experiments the intake of granite pebbles varied from 2·4 to 7·8 ounces per dozen eggs produced.

(c) Various feeding experiments are being carried out to determine whether high meal-meal rations should be supplemented by magnesium. Wheaten bran which is approximately 5 times as high in magnesium as maize, is available and the possibility therefore exists that rations might be too low in magnesium. Magnesium is necessary for the following functions:—

(i) Together with manganese, magnesium promotes the action of thiamin.

(ii) Magnesium is necessary for regulating excessive calcium in the body.

(d) Volume of mash ration: Various results point to a corresponding increase in the quantity of feed required for 1 lb. live weight and one dozen eggs, as the volume in c.c. per ounce of the mash ration is increased. Fibrous products such as lucerne meal, wheaten bran, maize bran and coarsely-ground oats may increase the volume of the mash ration to such an extent as to retard growth, cause the eggs to be unsatisfactory and render production uneconomical. With a high volume, feed consumption is low, mortality after the age of 6 days is high and chicks revert to feather eating from the age of 2 to 3 weeks. For effective feed consumption, it is calculated that the volume of chick mash should not be higher than 58 to 60 and not lower than 50 c.c. per ounce.

(e) *Breeding*:—

(i) *Sex-linked breed*: Every year a few hundred chicks are hatched to determine the colour of the down of the sexes and various records of colour heredity are kept.

(ii) *Gold-coloured Australorps*: This breed has not yet been officially recognized and further breeding work is being carried out.

Agricultural Economics.

Attention is being focussed on the following:—

(1) Analysis of agricultural price trends.

- (2) Analysis of agricultural soil values.
- (3) Extensive studies on the principles of farm business management applicable to South African conditions. This study will be completed in the course of next year.

Horticulture.

**Citrus Research Station, Addo, C.P.*

(a) *Fertilizer experiments*.—A fairly large fertilizer experiment is being carried out on Sunland Farms (Sunday's River). Already the experiment has yielded interesting and valuable data.

(b) *Demonstration experiments* (Sundays' River) were carried out with various irrigation systems. Owing to the serious water shortage this work had to be almost completely suspended. It must be pointed out, however, that the position in regard to the control of soil moisture and irrigation of citrus trees in the Sunday's River area may be regarded as very satisfactory in consequence of intensive studies since 1931. The greatest practical problem is that of obtaining sufficient supplies of irrigation water.

(c) *Grapefruit*.—Investigations in connection with stem-pitting in grapefruit. (This is a problem of extreme importance to the industry. Certain experiments have already revealed that the condition known as pitting may be transmitted by budding and that the underlying cause is probably a virus. This work, which is necessarily of a long-term nature, is being continued. It is hoped, by the careful application of bud-wood selection and also by other methods, to produce grapefruit trees wholly free from or at least resistant to this disease.)

Soil fertility and mineral nutrition of fruit trees, especially of citrus.—Sand-culture experiments are being carried out in respect of the rôle played by magnesium in the nutrition of citrus (deficiency and excess), and pot experiments with White-River soil are being continued in an effort to throw light on the so-called "greening problem" of the Lowveld. In connection with the latter problem it may be pointed out that pathologic and genetic studies are also being planned. It is felt that the possibility of a virus has perhaps not received sufficient attention, and the experiments which are now being planned will furnish scope for the investigation of this aspect too.

Incompatibility of certain graft unions of citrus species (so-called Bitter Seville rootstock problem).—During the past year particularly interesting results were obtained in this study. It has already been known for almost half a century that certain graft unions of citrus (e.g. sweet orange on Bitter Seville rootstock) are a complete failure in South Africa and in certain countries overseas, such as Java and parts of India. By making use of the principle of "Nucellar embryony" (by means of seed propagation) practically any graft union of citrus has been made to grow normally. There is only one possible explanation for this, namely that a virus (or viruses) is responsible for the phenomenon of incompatibility known in South Africa for so long, and that the virus may be satisfactorily eliminated by means of seed propagation. It is gradually becoming evident that the virus problem is of paramount importance in the cultivation of horticultural crops; these results should therefore be

* For this work a sum of £600 is annually made available by the Sunday's River Citrus Co-op. Co., Ltd., and £50 by Amanzi Estates.

regarded as very significant. The fact that South America (The Argentine and Brazil) has lost approximately eight million citrus trees during the past ten years as a result of virus diseases, and that large numbers of trees in California and elsewhere are also threatened, bears ample testimony to the gravity of the position.

Vegetable Growing.—Thus far, only a small vegetable garden on the experiment farm has been maintained, mainly for educational purposes and for the testing of certain types and/or varieties.

Dairying.

Taints in butter.—In this investigation organisms of the genera *Bacillus*: *Pseudomonas*, *Achromobacter* and *Flavobacterium* were studied since species of each of these genera have been suspected by various research workers of being the cause of tainted smells in butter.

In Canada this defect is known as surface taint. According to Canadian research workers, the main organism responsible for it is *Pseudomonas putrificiens*, also known as *Achromobacter putrificiens*.

In the United States people speak of various cheesy flavours such as cheddar, limburger and also of putrid flavours, and these are regarded as being similar to surface taint, but only in a different degree. In Australia the word "rabbito" is used to describe fleshy and putrid smells in butter. In other parts of the world, e.g. in New Zealand and Denmark, a product with this defect is described as foetid and putrid. In South Africa butter with this defect is known as "stinky butter" and the smell is probably more similar to the putrid smell described by research workers in Australia, than to the surface taint investigated by Canadian research workers.

The putrid smell in butter in South Africa has been found to be caused by the organism *Bacillus mycoides*. This organism has repeatedly been isolated from dairy products as well as from water. In some samples of stinky butter it has been found to be the predominant organism, while in others it was isolated with difficulty. The organism is an aerobic spore former usually found in soil. It is however, not as highly aerobic as most of the other species of the same genus. In samples of South African butter with this bad smell, the smell seemed to become more pronounced when the butter was cut. The organism was, however, present in greater numbers on the surface of the butter than inside. It is possible, therefore, that although the smell may be stronger on the surface, it will evaporate more rapidly on the surface, whereas on the inside of the samples, where evaporation has not taken place, it will be more pronounced.

The by-products of *B. mycoides* responsible for the smell have not yet been established. In milk the organism forms peptone and amino-nitrogen. It is possible that butyric acid and isovaleric acid are also formed, since these by-products are formed by *B. subtilis*, which is closely related to *B. mycoides*. It is also possible that amino compounds of these acids are formed in milk and that they cause the smell.

Further experiments were carried out to determine the sensitivity of *B. mycoides* to salt and sterilizing agents. *B. mycoides* is more resistant to salt than *S. lactis*, but the exact concentration which *B. mycoides* can tolerate depends on the medium in which it grows. It varies between 4 and 6 per cent., whereas *S. lactis* can tolerate between 4 and 5 per cent. The salt content of the serum of South

African butter varies considerably and usually ranges from five to ten per cent. It is therefore possible that the development of *B. mycoides* is not always prevented by the salt in the butter. The findings of some research workers overseas indicate that the development of the smell in butter may be partially chemical or otherwise that by-products which have already been formed in the cream or water, cause chemical reactions in the butter and are responsible for the smell. The reasons adduced for this are that the smell develops very rapidly and is too rapid for bacterial action at cold-storage temperatures; that it sometimes develops in butter with a high salt content (between 2 and 3 per cent. salt), and that the defect never occurs in fresh cream butter even if the cream from which the butter is made has been heavily inoculated with the suspected organisms.

B. mycoides is highly resistant to sterilizing agents, especially to chlorine compounds. The work is being continued.

Experiments with aluminium foil and parchment for packing butter.—During the year a series of experiments were carried out with a new type of lining for butter boxes and wrappers. The paper consists of three layers; one layer is aluminium foil with parchment on either side.

These new linings and wrappers ought to be very effective in keeping out the smell of the box wood and other foreign odours, provided the butter is packed well, but so far this expectation has not been substantiated by results.

Experiments with "Roccal" sterilizing agent.—"Roccal" is a new type of chemical sterilizing agent. Its active constituents are quaternary ammonium chlorides. It is similar to "Zephiran" but is free from the smell associated with the latter. Roccal is manufactured for use in the dairy industry.

Experiments were carried out on the sterilization of apparatus and equipment. It was found that the product is particularly effective for the sterilization of both metal and wooden surfaces and in this respect it compares favourably with chlorine sterilizing agents. It has the added advantage of having no corrosive action whatsoever on any metal.

Roccal was also found to be effective for the sterilization of wrapping paper for butter. The wrapping remains sterile for a longer period than when treated with formalin or chlorine sterilizing agents.

It is possible to sterilize water completely with a dilution of one part of Roccal in two thousand parts of water, even if the water is contaminated with organic matter and inoculated with mixed cultures. It was found, however, that organic matter such as milk residues, considerably retards sterilization with Roccal.

As a spray for killing mould on walls and shelves, a solution of one per cent. of Roccal has proved quite sufficient.

Contaminated water.—Contaminated water plays a very important rôle in the defects of dairy products. This fact emerged very clearly from the analyses of defects in dairy products delivered at the Institute for examination. Thus, the so-called "stinkers" are due almost exclusively to the use of contaminated water in the manufacturing process. In view of the considerable losses suffered annually by the dairy and other food industries as a result of contaminated water supplies, it was decided to institute an investi-

RESEARCH IN AGRICULTURAL PROBLEMS.

gation into the bacterial content of water samples from various sources, and the agents which could be employed for the successful treatment of the water.

The bacteria which are mainly responsible for the decay of food products are the proteolytic (protein-splitting), lipolytic (fat-splitting), oxidation-positive and hydrolitic organisms, most of which belong to the genera *Pseudomonas* and *Achromobacter*, and to a lesser extent, to the genus *Celcaligenes*.

The fact that most of these organisms can develop at cold-storage and even freezing temperatures, enables them to cause decay in food products in cold-storage and refrigerators.

The following points from a summary of bacterial analysis of water samples delivered at the Institute over the past thirteen years, are worthy of mention:—

- (i) From a total of 295 samples examined bacteriologically, 245 were examined for proteolytic organisms; only 12 per cent. of these contained no proteolytic organisms in 1 ml.; of these 12 per cent., 8·5 per cent. are known to have been subjected to chlorination or other sterilizing treatments. It is therefore possible that only 3·43 per cent. of the samples contained no proteolytic organisms in 1 ml. (millilitre).
- (ii) The total of 295 water samples were grouped as follows as regards the bacterial content of the samples:—

	Percentage.
Over 1 million per m.l.....	5·1
200,001–1 million per m.l.....	12·5
100,001–200,000 per m.l.....	9·5
50,001–100,000 per m.l.....	11·2
10,001–50,000 per m.l.....	20·3
1,001–10,000 per m.l.....	17·0
101–1,000 per m.l.....	13·2
Less than 100 per m.l.....	11·2

If, in a study of the above table, regard is also had to (i), it can be deduced that in practically all the cases where the bacterial counts were below 100, the reason is to be sought in some sterilization process or other.

In so far as the health standard for water supplies in municipalities usually lays down that the total number of bacteria which develop at standard agar at a temperature of 37° C. for 48 hours may not exceed 100 ml., and that *E. coli* must be absent in 50 ml. of the water sample, it may be concluded that the water supplies in the Union are, generally speaking, severely contaminated.

The efficacy of various disinfectants.—In this study the following preparations were examined:—

- (a) Stabilized chloramine T with 4 per cent. available chlorine.
- (b) A stabilized hypochlorite with 50 per cent. available chlorine.
- (c) Freshly prepared bleaching powder with 25 per cent. available chlorine.
- (d) A 0·4 per cent. solution of sodium hydroxide.
- (e) A 10 per cent. solution of a fourfold ammonium compound.

It was found that after two months the chloramine T product had lost 4·49 per cent., the hypochlorite 3·64 per cent. and the

bleaching powder 16 per cent. respectively, of their available chlorine when stored in containers which were opened only when the products were needed for use.

TABLE "A"—Average Fat Content of Milk in South Africa.

(Calculated from figures received from Cheese Factories, Condenseries, Health Officers and Research Workers.)

Area.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Ave. range.
Western Cape Province.....	3.68	3.72	3.83	3.86	3.96	3.91	3.79	3.76	3.66	3.62	3.62	3.67	3.76
Robertson District.....	3.83	3.95	4.11	4.27	4.29	4.23	4.07	3.91	3.80	3.79	3.80	3.75	3.92
Eastern Cape Province.....	3.44	3.60	3.70	3.88	4.00	4.00	3.83	3.75	3.67	3.57	3.48	3.41	3.69
Aliwal-Elliot-Barkly East.....	3.66	3.75	3.87	3.96	3.95	3.87	3.80	3.68	3.61	3.61	3.58	3.63	3.75
East Griqualand.....	3.48	3.56	3.67	3.75	3.71	3.61	3.53	3.45	3.40	3.38	3.39	3.41	3.53
Southern Natal.....	3.78	3.81	3.89	3.88	3.87	3.75	3.64	3.60	3.59	3.58	3.64	3.70	3.73
Central Natal.....	3.64	3.71	3.78	3.83	3.86	3.71	3.64	3.55	3.53	3.56	3.66	3.60	3.66
Eastern Free State.....	3.61	3.71	3.83	3.93	3.92	3.72	3.56	3.43	3.41	3.45	3.48	3.48	3.63
Southern Transvaal.....	3.44	3.51	3.59	3.61	3.60	3.60	3.57	3.44	3.36	3.40	3.42	3.45	3.50
Union (Average of all available figures).....	3.59	3.67	3.79	3.87	3.88	3.75	3.64	3.53	3.48	3.49	3.50	3.51	3.64
Condenseries (4).....	3.63	3.71	3.82	3.91	3.92	3.80	3.68	3.56	3.52	3.54	3.56	3.57	3.67
Cheese factories (35).....	3.58	3.68	3.80	3.90	3.89	3.75	3.61	3.48	3.46	3.47	3.48	3.48	3.63
Registered Friesland cows in 9 areas.....	3.51	3.59	3.64	3.71	3.72	3.65	3.61	3.56	3.55	3.52	3.50	3.49	3.59

There was practically no difference in the bacterial effectiveness of the products which all possess a high capacity for destroying bacteria (99+ per cent.) Chloramine T, however, has the disadvantage that its optimum efficacy is contingent upon high temperatures.

Owing to their corrosive action on metal, bleaching powder and sodium hydroxide should be completely eliminated. These substances even affect stainless steel. Chloramine T and stabilized hypochlorite have more or less the same effects, which are noticeable on metal. The fourfold ammonium compounds had the smallest effect on metal of all the sterilizing agents, and are very promising as a sterilizing agent for dairy apparatus.

Reliability of the dairy cattle improvement and general milk recording scheme.—The scheme is being investigated with a view to establishing its reliability, its expansion, and possible improvements to be introduced. The work has not yet progressed sufficiently for any conclusion to be drawn.

The accuracy of solids-not-fat determinations by means of the Richmond formula.—Results obtained with the Richmond formula were compared with those determined by the gravimetric test. In preliminary observations it was found that the results with the Richmond formula do not completely correspond to those obtained with the chemical test and also that they vary with the seasons. From June to September the results are, on an average, 0.08 per cent. too high, from October to May they are, on an average, 0.10 per cent. too low and in the course of a year they are, on an average, 0.04 per cent. too low. The work is receiving further attention.

An analysis of the monthly fat content of milk in South Africa.—In this study an attempt was made to reflect the average fat content of milk for each month of the year for various areas. For this purpose use was made of results kindly supplied by four condenseries and 35 cheese factories, as well as tests placed at the disposal of the Institution by health officers and research workers (Table A.).

A feature emerging from the table is that the average fat content in most parts exceeds 3.50 per cent. from month to month, and that in all the areas covered, it is on an average, 3.64 per cent. For Friesland cows in these areas the lowest percentage is 3.49 in December, and the average, 3.59 per cent. The highest percentages fall between March and May and the lowest between September and December.

The standard of amylalcohol for use in the Gerber test.—It was found that from time to time there were supplies of amylalcohol in the trade which gave inaccurate results. Samples of these supplies were tested and it appears that these inaccuracies are due to impurities in the alcohol which influence the tests. These impurities were established as being of a threefold nature, viz. a substance which is more volatile than amylalcohol and which, in the first fractions, were concentrated by distillation; a second substance which is less volatile and is distilled with the last portion, and a third product which forms a residue in the boiler. An improved process for the preparation of the alcohol is being worked out and it is expected that the findings will be published shortly. A preliminary report on this subject appeared in the December, 1946 issue of *Farming in South Africa*.

Entomology.

(a) Studies in connection with the biology and anatomy of termites are being continued.

(b) Investigations in connection with the eggs of the brown locust, *Locustana pardalina*, are being carried out, inter alia, by an officer sent to the University of Cambridge for two years to work under the well-known authority, Dr. Wigglesworth.

Control of Insect Pests.

T. J. Naude, M.Sc., Ph.D., Chief, Division of Entomology.

Amongst the outstanding features in pest incidence during the past year, special mention may be made of the damage caused by beetle borers to timber and buildings, the wide-scale damage by the drywood termite *Cryptotermes brevis* in Durban, the extensive outbreak of wattle bagworm, widespread outbreaks of lucerne caterpillar, very extensive damage to grazing by several species of termites and the discovery of pernicious scale in the Langkloof fruit district.

Plant Regulatory Service.

Three ordinary meetings and one special meeting of the Board were held, and the following subjects dealt with:—

Citrus Black Spot, Orchards and Field Crops Cleansing Bill, Importation of Fruit-trees, Commonwealth Scientific Conference, Improving the Position of Plant and Nursery Inspectors, Importation of Citrus Peel, Pernicious Scale, Importation of Barley, "Pineapple" Disease of Carnations, Codling Moth at Haenertsburg, Granville Disease of Tobacco, and Colorado Potato Beetle.

Agricultural Pests Act.

Owing to the discovery of pernicious scale at Joubertina, in the district of Uniondale, the removal of host plants and possible host plants from any place in the area falling within a radius of twelve miles from the Post Office, Joubertina, except on the written permission of the Department, was prohibited by Proclamation No. 16 of 1947.

By Proclamation No. 243 of 1946, the total prohibition on the importation of citrus fruit and citrus peel was removed, and by Government Notice No. 2526 of 1946 these articles were declared to be "Plants" for the purpose of paragraph (a) of subsection (3) of section nine of the Act. This means that a permit is necessary for their importation; the issue of such a permit to which conditions to prevent the introduction of insect pests and plant diseases may be attached, is at the discretion of the Department.

By Government Notice No. 1445 of 1947 unmanufactured cotton, unmanufactured broom corn and brooms, brushes and other articles made from broom corn derived from *Sorghum*, unmanufactured and leaf tobacco and unmanufactured cork derived from the cork oak tree, were also declared to be "Plants" for the purpose of the paragraph mentioned.

Under Proclamation No. 161 of 1947 the total prohibition on broom corn and brooms and other articles made from broom corn derived from *Sorghum* containing uncrushed stalks was modified by allowing such articles to be treated against insect infestation to the satisfaction of the Department before admission. By the same Proclamation the introduction of citrus trees and of lucerne seed and plants was permitted from Southern Rhodesia and the adjoining British Protectorates.

By Proclamation No. 162 of 1947 Upington was declared a port of entry for plants.

CONTROL OF INSECT PESTS.

Owing to the discovery of black scab or warty disease of potatoes within the municipalities of Belfast, Carolina, Ermelo and Hendrina, the removal of potatoes and root crops and plants with soil attached from these areas, except under permit, was prohibited by Proclamation No. 183 of 1947, while by Government Notice No. 1525 of 1947 the cultivation of potatoes other than certain stated varieties accepted by the Department as immune to the disease in these areas, as well as in the municipalities of Volksrust and Wakkerstroom and the township of Charlestown, was prohibited except under permit from an officer of the Department, and in accordance with the conditions laid down therein.

Orchards and Cultivated Plants Cleansing Act No. 26 of 1947.

This Act was passed during the last session of Parliament. The Orchard Cleansing Act, No. 13 of 1925, has been repealed and it will be necessary to issue another Proclamation to apply the new Act to the areas where the old Act had been in force, if the fruit growers there are still in favour of compulsory cleansing measures.

Importation of Plants and Plant Products.

Altogether, 629 permits were issued for the introduction of plants and plant products, 118 for beeswax and foundation comb, and 60 for seed potatoes, as compared with 488, 134 and 48, respectively, for the previous twelve months.

The pests intercepted in imported consignments were mealy bug on a saxifrage plant from Norway, a colony of ants in the case of bananas from Mauritius, and larvae in a parcel of acorns from the United Kingdom. Timber importations were more free from insect infestation than was the case last year, probably because importers no longer had to be satisfied with what the sellers were pleased to supply, and could import a better quality of timber. In one consignment of Canadian spruce and in one of pitch pine from the United States, live beetle larvae and pupae were found under bark on the waney edges. These were removed and destroyed. In several other consignments there were old workings of Cerambycids, bark weevils and bark beetles, but no live insects were present. Maize from the Argentine arrived in large quantities, and most consignments were infested with cosmopolitan grain pests, against which it was not practical to take any steps.

In Transit Inspections.

No pests were recorded on plants offered for transportation between places within the Union, except one slight infestation of white peach scale on granadilla. Unfortunately this cannot be regarded as an indication that there is little risk being incurred of pests being spread with these consignments. If all such consignments could be inspected, it is likely that several would be found to be infested.

There was a resumption of the importation of apples from North America. Most of the consignments were free from insects or plant diseases. In one case *Fusicladium* was reported.

Export Certificates.

The number of certificates issued for plants and plant products exported from the Union rose to 1474. For the two previous years the numbers were 1295 and 1209 respectively.

Nursery Registration.

The number of registrations of nurseries and dealers in plants was 707, an increase of 71 over that of the previous year. Of these, 180 were registered for vines only—all in the Cape Province. Besides these, 227 others were registered in the Cape, 77 in Natal, 195 in the Transvaal, 27 in the Orange Free State and one in Basutoland.

Several nurseries were inspected twice during the year, and the total number of inspections made by the Nursery Inspectors alone was 574, which is 20 more than last year.

The stock held in nurseries according to the information supplied with the applications for registration was as follows:—

	1945-1946.	1946-1947.
Citrus trees.....	259,963	376,681
Deciduous fruit trees.....	2,977,872	3,579,293
Forest trees.....	19,579,568	24,488,730
Greenhouse stock.....	200,782	276,509
Hedge plants.....	2,288,324	2,456,846
Ornamentals.....	903,891	859,048
Vines.....	1,311,106	1,489,678
Palms.....	159,768	144,334
Roses.....	1,852,840	2,826,773
Other fruit trees.....	723,468	1,101,204
TOTAL.....	30,342,148	37,779,096
	1945-1946.	1946-1947.
Citrus stocks.....	573,300	682,850
Deciduous fruit tree stocks.....	2,753,100	2,805,750
TOTAL.....	3,326,400	3,488,600

Stock in vine nurseries in addition to those mentioned above:—

	1945-1946.	1946-1947.
Grafted vines.....	3,451,000	3,722,500
Cuttings.....	3,560,500	4,603,500
Rooted cuttings.....	641,500	1,003,500
TOTAL.....	7,653,000	9,329,500

Nursery Quarantines.

Nine quarantines were imposed during the year and two were brought forward from the previous year. Of these, nine were removed and two still remain in force. There was an increase of four in the number of quarantines imposed.

Five of the quarantines were imposed on account of red scale only, one on account of pernicious scale only, one on account of circular purple scale only, one on account of both red and circular purple scale, and one on account of pernicious and Ross scale.

Outbreaks of Pests and Diseases.

An outbreak of pernicious scale was discovered at Joubertina. The outbreak had not spread very far, but the Department considered that it would not be justified in making an attempt to eradicate the pest. Arrangements were therefore made to spray the infested and suspected trees at Government expense. This was carried out during the winter by the Plant Inspector from Villiersdorp.

CONTROL OF INSECT PESTS.

Codling moth has been discovered in the Haenertsburg area, which was believed to be still free from this pest, and into which the removal of pome fruits and of second-hand fruit cases was prohibited. It has not yet been decided whether the restrictions will be removed.

Citrus black spot (*Phoma citricarpa*) has been found to be widely distributed in Natal and the northern Transvaal. Three outbreaks have also been discovered in the eastern Transvaal and one in the district of Rustenburg, but none so far in the Cape Province or the Orange Free State. The Plant Regulatory Board therefore recommended and the Department approved that the restrictions on the nurseries in which the disease was discovered should be somewhat relaxed. They are now permitted to send their stock anywhere in the Union, except to the Cape Province, Orange Free State and the districts of Rustenburg and Marico. The precautions previously laid down, viz. regular spraying with Bordeaux mixture, defoliating trees before despatch and dipping in or spraying thoroughly with Bordeaux mixture immediately before despatch, are still required. Moreover, the nurserymen have been informed that they must transfer their nurseries to a clean locality, approved by the Department.

Black scale or warty disease of potato has been discovered in four more municipalities, viz. Belfast, Carolina, Ermelo and Hendrina, necessitating the imposition of restrictions on the growing of potatoes and the removal of certain articles from these areas, as mentioned above.

Revenue.

The fees for the registration of nurseries amounted to £2,092, and for the re-inspection of nurseries to £9, as compared with £1,889 and £5 for last year.

The fees for the fumigation and disinfection of imported consignments amounted to £31. 10s. 6d. and for treatment of in transit consignments to £4. 4s. 6d. as compared with £11. 10s. 6d. and £2. 12s. 6d. for last year.

The revenue received for nursery registration, the number of nurseries registered and the number of nursery inspections all show new records.

Locust Research.

A full account of locust outbreaks and campaigns conducted is contained in a separate report under the heading "Locust Destruction".

The Brown Locust (*Locustana pardalina* Wik.).

A. Outbreaks.

Incipient hopper outbreaks occurred during the past summer season as follows:—

- (1) After the first summer rains in the districts of Hopetown, Hanover, De Aar, Phillipstown and Colesberg, according to forecast,
- (2) during the second half of the season also in Middelburg, Hofmeyr, Cradock, Graaff-Reinet and Aberdeen, where outbreaks were not expected.

This inaccuracy of the forecast can in a measure be attributed to the severe drought which prevailed for most of the summer season

in the outbreak region of this species. But other factors, on which we have insufficient information at the moment, may also have contributed in a greater or lesser degree. Such factors are for instance—

- (1) migrations of *Solitaria* and "Transiens" adult populations;
- (2) the densities necessary to constitute critical populations; and
- (3) the question whether identical populations are always of equal importance.

As a result, however, of an efficient intelligence organization and the use of a quick-acting bait containing benzene hexachloride, it was possible to control all incipient outbreaks successfully. Consequently, no flying swarms were formed which could infest neighbouring districts and menace agriculture. Forecasts for the following season are reflected in the report on locust destruction.

B. Grazing Experiment, Grootfontein College of Agriculture.

This experiment has now been in existence for five years and the indications so far are that overgrazing appears to favour locust increase, whereas light grazing makes an area less suitable for population increase.

This experiment is to be continued for an indefinite period and an experiment of a similar nature is shortly to be commenced in the Prieska-Kenhardt outbreak area.

C. Population studies in outbreak areas.

Intensive population studies continued in the following three outbreak areas: Middelburg-Hofmeyr, De Aar-Richmond and Prieska-Kenhardt.

Incipient hopper outbreaks occurred in the Middelburg-Hofmeyr outbreak area from about the middle of November 1945 to the end of February 1947, but control operations were only carried out during January and February, 1947. Although critical flier populations were observed in various localities during early March 1947, only small hatchings of *solitaria* nature occurred towards the end of the month. Adult populations collected during April 1947 exhibited "*Disso-cians*" characteristics as judged by the sexual dimorphism ratio. Locust birds (*Ciconia ciconia*) were present in large numbers from about the middle of January to February, 1947. The indications are therefore that the locust population in this outbreak area was of phase "*Transiens dissocians*" before the winter of 1947, but it is by no means a forgone conclusion that the locust population is therefore on the down grade.

In the De Aar-Richmond outbreak area repeated incipient hopper outbreaks occurred in the eastern section, but no workable outbreaks occurred in the western section. Although critical flier populations also occurred in the western section from time to time, hopper populations never attained such densities as to warrant the adoption of control measures. There are also indications that adult populations present in this area before the winter of 1947 were of phase "*Transiens dissocians*".

In the Prieska-Kenhardt area locust populations remained on a low level throughout the season.

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D. Field Research Camps.

During the course of the summer season three field research camps were established in Hopetown, Hanover and Aberdeen, mainly to test out substitutes for sodium arsenite as the poisonous principle in baits. The results obtained can be briefly summarized as follows—

- (1) Benzene hexachloride is an entirely satisfactory substitute for sodium arsenite in locust bait.
- (2) Very satisfactory mortalities were obtained at 0·5 per cent. benzene hexachloride or 0·5 per cent. of the gamma isomer.
- (3) Benzene hexachloride is compatible with sodium arsenite in baits and it was therefore found possible to dilute the existing stocks of sodium arsenite bran bait with an equal volume of sawdust and to add benzene hexachloride according to the following formula:—

Sodium arsenite-bran bait	32 lb.
Sawdust (wattle or gum)	18 lb.
Benzene hexachloride (20 per cent. in talcum)	1½ lb.
Graphite (warning colouration)	6 ozs.
- (4) Bait containing benzene hexachloride is very much quicker in its action than sodium arsenite bait.

E. Air-spraying Experiments.

As a result of preliminary and small-scale field experiments, an experimental air-spraying campaign was conducted against brown locust adults on the ground in the districts of De Aar and Hanover during January 1947. The poison sprayed was 20 per cent. and 40 per cent. benzene hexachloride solutions in diesel oil. Anson aircraft were used for the air-spraying tests. Very promising results were obtained. As a further result of this work, a large-scale experimental air-spraying campaign against escaped swarms of the red locust has been undertaken in the Rukwa Valley, one of the outbreak areas of this species in Central Africa.

Further tests will also be made in the Union during the coming season to perfect air-spraying technique and also to test oils of different viscosities.

F. Cage and Laboratory Experiments.

A large number of laboratory tests were carried out mainly to test substitutes for sodium arsenite in bait. Large numbers of spraying and dusting experiments were also carried out.

Briefly the results obtained can be summarized as follows:—

- (1) 0·5 per cent. benzene hexachloride is much more effective against locust hoppers than 3 per cent. sodium arsenite in pure maize bran.
- (2) With sodium arsenite as the poisonous principle, a mixture of maize bran and sawdust, 50:50 by volume, makes equally good or better bait than when pure bran is used as the carrier.
- (3) In contrast to this, the mixed carrier does not seem to be as good as pure maize bran when benzene hexachloride is the poisonous principle.

- (4) Pure sawdust was demonstrated to be a very poor carrier for both sodium arsenite and benzene hexachloride, as well as for a mixture of the two poisons.
- (5) Usually benzene hexachloride alone in baits gave higher mortalities than the same strength of benzene hexachloride with sodium arsenite in addition. This was, however, not corroborated by field-scale tests.
- (6) The use of benzene hexachloride alone at 1 per cent. strength gave no better results than 0.5 per cent., but when sodium arsenite was also present the increase in strength of benzene hexachloride did increase mortality.
- (7) The locally manufactured benzene hexachloride is as effective as the imported product.
- (8) Benzene hexachloride is not repellent to hoppers of the brown locust and there is some indication that it may even be attractive.

The Red Locust (*Nomadacris septemfasciata*).

There have been no swarms of this species in the Union during the period under review. Attempts at tentative control of the species through action in, and at present around, the permanent breeding areas are reflected in the administrative report.

Biological Control of Prickly Pear.

Cactoblastis cactorum, though small in numbers, still remains present in the general background and still retains its usefulness especially in respect of isolated prickly pear plants on which the insect tends to concentrate. Its presence in numbers on luscious regrowth of felled pear is also very marked in certain areas.

Cochineal (Dactylopius opuntia).—The total area now cleared of prickly pear by the help of this insect is estimated at some 800,00 morgen. From a monetary point of view this help to the State has been valued at something like £7,600,000 thus far. As a result of the partial consummation of the campaign in such areas as have permitted of final felling, it has been possible to redemarcate the residual biological area which is now confined to the districts of Uitenhage (part), Port Elizabeth, Alexandria, Albany (part), Humansdorp, comprising a prickly pear acreage of about 50,000 morgen.

In this residual area the status of cochineal is weak for the reasons enumerated below. In the inland part of the biological areas presumably doomed remnants of prickly pear remain, control being dependent on the persistence of cochineal in sufficient strength to complement the felling campaign. Cochineal in the residual zone is largely hampered by the parasitic fungus *Emrusa lecanii* which proved to be present recently in 80 per cent. of localities inspected in thirteen prickly pear districts. Its other main enemy is *Cryptolaemus montrouzieri* and *Erochomus flavipes* in the coastal belt, and at the present stage the latter insect only in inland areas where *Cryptolaemus* has now dropped out of the picture.

The number of colonies of cochineal subject to routine inspection to keep abreast of the position has been greatly reduced by felling, only sixty now remaining. Nevertheless, a large amount of routine observation still has to be maintained. From these records it is clear that drought conditions over the past three years have greatly

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favoured the regeneration of cochineal in the inland areas where *Empusa* is not strongly established and also that these predators are more abundant in winter than in summer. Mortality counts of *Exochmus* from parasitism by *Chiloncurus* sp., *Coenocytus* sp. and *Homalotylus* sp., as well as from other causes, e.g. lethal high temperatures and desiccation, continue. Mortality from all causes combined over four years has ranged from 36 per cent. to 80 per cent. and does not seem to vary excessively from one season to the other.

A special examination of cochineal on pest pear in the Transvaal during September, 1946, indicated a condition ensuring excellent results from felling at that time in the Pietersburg and Rustenburg areas. In the Schoonoord-Lydenburg area, however, depletion, mainly by *Exochmus* and *Cryptolaemus*, was so severe as to indicate delay of felling until suitable recovery of the population was in evidence.

Lagochirus beetle (*L. funestus*).—Although the results of liberations over three years have been very disappointing, the mass-breeding and distribution of this insect have been continued in the hope of ensuring an impetus to breeding under our local conditions in due course. Mass-breeding therefore continues both at Uitenhage and Fort Beaufort. The indications are that the nature and amount of local rainfall have a strong bearing on oviposition of the insect in Nature. In the laboratory, rearing under controlled conditions is highly successful, up to 53·5-fold increase per generation being achieved.

Cactophagus Weevil (*C. spinolae*).—This insect, the fourth ally of *Cactophagus cactorum* introduced, arrived in a consignment just over 800 strong from Mexico in August, 1946. Used thus far only for mass-breeding in the laboratory, the insect has done very well in captivity, females of unknown age having lived and oviposited for over nine months in cages. The actual breeding potential is not yet fully known, but the damage to pear stumps and foliage is striking. The main limitation is initial numbers to breed from, a defect which has just been partly remedied by fresh importations up to the limit available.

This beetle, during the drought period of the winter of 1946 and early summer of 1947, appeared to be unable to penetrate with its proboscis any *O. megacantha* pear leaf pads except the young, tender terminal ones, or scars and cracks or broken off ends of the older succulent and woody segments, because of the thick, tough nature of the epidermis of this species of *Opuntia*. However, after the rainy period later, the beetle readily penetrated the less succulent segments for oviposition and feeding. The larvae destroy the tissues of both succulent and woody joints of the pear and eventually form a cocoon covered with fibres from the plant. From these the adults in due course emerge.

The Control of Cochineal in Spineless Plantations.

An article on this subject was contributed to *Farming in South Africa*, and another paper, read at a meeting of the Vigilance Committee of spineless cactus growers at Middelburg, was published in the *Farmer's Weekly*.

Biological studies of D. opuntia on spineless cactus.—Investigations were carried out at Uitenhage from November 1946 to February 1947 to determine the length of life, period of reproduction

and average progeny per female feeding on spineless cactus. The data obtained showed that the number of days during which a female will produce larvae ranged from 22 to 91, with an average of 66 for each adult. The number of larvae produced by a female ranged from 132 to 990, with an average of 508 per female. The records indicate that heavy showers of rain, which usually last only a few hours or less, can have little effect in reducing the cochineal population, i.e. the crawling larvae in a spineless plantation, considering that comparatively few larvae are born every 24 hours during the long reproduction period. Hail, of course, would have a more serious effect as it would destroy many adults. These data also explain why a considerable number of sprays would have to be applied to control the insect unless the spray was sufficiently penetrating and lethal to destroy adults and partly mature females as well as the larvae. This is all the more necessary considering that there is a great overlapping of generations in a plantation or even on a single considerably infested cactus plant, resulting in the birth of progeny daily from October to about the end of May or until winter in the Karroo.

Spray tests.— Spray tests with Triton D.D.T. emulsion, at concentrations of $\frac{1}{2}$, 1 and $2\frac{1}{2}$ per cent. actual D.D.T. were carried out at Grootfontein and on the farm Anniedale in the Hofmeyr Division. Further tests were made at Uitenhage with Cytox wettable powder so diluted as to contain 1 per cent. actual D.D.T.

Spray Investigations at Grootfontein.—A block of spineless cactus (*O. fusicaulis*) occupying 1247 square yards, with plants and rows five feet apart, and the plants 4 to 5 feet high, each consisting of 50 to 70 succulent and woody segments, was divided into 3 sections. The 3 sections were sprayed with Triton D.D.T. Emulsion at concentrations of $\frac{1}{2}$, 1 and $2\frac{1}{2}$ per cent. actual D.D.T. All the plants were fairly heavily infested with cochineal at the time of the first spray. The sprays were applied thoroughly at an average of 75 lb. pressure through a disc nozzle, by means of a small Myers petrol pump on wheels, pushed by hand.

It was estimated that with such an outfit the labour costs per morgen to such cactus spaced as mentioned would be about 22s. 6d. for the three natives required, and £3 per morgen, if in addition a European supervisor were required. It was determined that at the present price of D.D.T. Triton stock emulsion containing 25 per cent. actual D.D.T., i.e. 24s. 6d. per gallon, the cost in material alone for one spraying with a solution diluted to 1 per cent. actual D.D.T. would be about £36. 15s. 0d. per morgen, or approximately 3d. per plant. The cost in material of a solution containing $2\frac{1}{2}$ per cent. actual D.D.T. would be proportionately greater, i.e. about 7d. per plant and at least £90 per morgen for one application! Plantations of course vary in size of plants, their spacing and in width of rows. But even allowing for a morgen to contain only half the number of plants of the size used in the spray tests, the cost in spray materials required for one $2\frac{1}{2}$ per cent. D.D.T. Triton spray would be about £45 per morgen!

Effective control of cochineal was obtained in the $2\frac{1}{2}$ per cent. D.D.T. plot by two applications of this dilution; and in the 1 per cent. actual D.D.T. plot by three applications of this dilution, at a month to six weeks' interval in summer between the applications. The control was not so good in the $\frac{1}{2}$ per cent. D.D.T. plot after three applications at this strength, and there were still surviving

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larvae and more or less mature females on many of the leaf pads of this plot about a month after the third spray. The first spray was applied on 15th October, 1946, when the first larvae of the season were appearing on the leaf pads.

The results indicate that one application of Triton emulsion diluted to contain $2\frac{1}{2}$ per cent. actual D.D.T., followed by one or two sprays of 1 per cent. actual D.D.T. at monthly intervals, will get and keep the insect well under control if applied copiously and thoroughly at high pressure in summer, beginning about the middle or third week of October or as soon as numerous crawling larvae are evident. The degree of infestation the following summer in a plantation would determine the number of applications necessary.

Spray Investigations at Uitenhage.—At Uitenhage tests were made with Cyttox wettable D.D.T. powder so diluted as to contain 1 per cent. actual D.D.T. The sprayings were made by means of a bucket pump with disc nozzle at intervals of about two weeks from December 30th to April 10th on a few spineless cactus plants well infested with cochineal. The results showed that living larvae continued to be born from females that survived the spray treatment together with some of their parents over a period of four months of spray treatment, and that even after the eighth spray was applied a few mature females were still alive. Some leaf drop from the plants occurred during the spraying period as a result of the depredations caused by females in various stages of maturity, all of which were not killed by the spraying. It is concluded from these observations that D.D.T. in the form of a wettable powder will destroy only crawling or young larvae and that a spray programme of at least eight applications of 1 per cent. actual D.D.T. dilution at fortnightly intervals, and probably more in cases of heavier infestation and consequent greater overlapping of generations would be necessary each summer to get and keep the insect under control in a spineless plantation where the insect has become well established. Eight applications were required to effect fairly good control at Uitenhage on the few plants tested. D.D.T. in wettable powder form cannot be recommended because of the necessity of applying so many sprays and the high labour costs involved to obtain reasonable good control. Labour costs alone would certainly amount to over a pound per morgen for each application if plants were 4 to 5 feet high, spaced 5 feet apart. With power-spraying at say 150 lb. the number of sprayings necessary might possibly be reduced.

The State of Present Spineless Cactus Plantations, and Control of Cochineal by Spraying.

A number of spineless cactus plantations were inspected in the Hofmeyr and Steynsburg Divisions during the year. Observations show that infestation by *D. opuntiac* has now become so widespread in most cases as to make control of cochineal in the districts by spraying with D.D.T. emulsion impractical because of the extremely high cost involved. It is possible that plantations sufficiently distant from extensively infested areas exist farther north of these districts where the infestation is still sufficiently limited to make control practical, but a survey would be necessary to determine this.

Present methods of close planting of cactus, in rows narrowly spaced, and either grazing of the crop by cattle or allowing the plants

to fruit, and the practice of maintaining large uncultivated plantations of 50 to several hundred morgen, will have to be abandoned; such plantations will possibly have to be eradicated together with all prickly pear in these districts before it will be practical to keep this insect under control by spraying in smaller plantations. Most present plantations comprise spineless varieties which are unsuitable for the successful control of cochineal by spraying because of the low spreading habit of growth, and which bear fruit abundantly that is covered with numerous spicules. The variety *O. fuscicaulis* has an upright growth, does not bear fruit freely, and has well spaced branches. This is the most suitable variety for cultivating of those which are susceptible to cochineal attack. *O. monterey* is the only variety which is not susceptible to serious injury by the cochineal, but there is some question of the advisability of using this as a forage crop because of the somewhat spiny nature of its leaf pads.

Pests of Subtropical Fruits.

Citrus thrips (*Scirtothrips aurantii*).—At Nelspruit a series of nine different treatments was tested against this pest. They comprised benzene hexachloride emulsion 0.2 per cent.; D.D.T. dust 5 per cent.; D.D.T. dust 4 pts 0.2 per cent.: 100 in sulphur (1 and 2 applications); sulphur (2 applications); wettable D.D.T. 0.2 per 0.05 (1 and 2 applications); 25 per cent. D.D.T. emulsion at 0.05 per cent. dilution (1 application); and tartar emetic 4:4:100 (2 applications). Whilst all these treatments gave commercially satisfactory results, excepting the benzene hexachloride which was perhaps tried at too low a concentration, the results with wettable D.D.T. are markedly outstanding, the more so as a single treatment on account of the residual effect imparted was sufficient. This fact is a very hopeful one to citrus growers possessing a spray outfit as it signifies that a second spraying, which is often difficult to work in within the 10-day interval required, may now be dispensed with. Another important indication is that the addition of D.D.T. powder to sulphur yielded 11 per cent. more clean fruit than sulphur alone and therefore seems definitely worth-while.

False Codling Moth (*Argyroplote leucotreta*).—Throughout the Sundays River Valley the incidence of this pest has recently been serious and the highest on local record. Although the trend is at present downward, attempts were made in March-April 1947 to test the effects of chance spraying with D.D.T., two and four respectively, despite the well-known facts of difficult penetration of spray and of overlapping generations. The actual infestation, however, had dropped from over 10 per cent. to less than 2 per cent. of the crop since the previous season, and though sprayed plots gave definitely less infestation than controls, the result in view of low general infestation was inconclusive. Similar tests, including the use of Gammexane at Nelspruit (2 sprayings), also gave unconvincing results.

The pest also showed up in the Kat River Valley, Alice, Albany and Bathurst. At Nelspruit sanitation *versus* non-sanitation for false codling moth had again the advantage of 3.7 per cent. as against 6.7 per cent. infestation of the total crop, and showed moreover definite advantage in apparently diminishing the total loss from all causes combined.

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In avocados, false codling moth infestation as a predisposing factor to anthracnose is still successfully and economically controlled by the protection of fruits with paper bags in Itzamna, Marzapan and Natal varieties. In other varieties anthracnose is not a problem on account of their shorter growing season.

Oil-spraying for scale control.—Sets of tests run over 7 years have been completed and show no hold-over effect of any kind on the trees at either of the two centres, Nelspruit and Port Cox.

Soft scale (Lecanium hesperidum).—It has been shown at Port Elizabeth that whilst both benzene hexachloride and D.D.T.-treated barriers are satisfactory in winter, they fail to repel ants in summer, whereas the mercuric chloride-shellac barrier repels throughout the year.

Natal fruit-fly (Pterandrus rosa).—Some interesting toxicity tests have been conducted at Nelspruit. These show that whilst dry bait is definitely taken by the fly and is effective, wet bait is better and quicker; that both D.D.T. and benzene hexachloride appear to be better and quicker than sodium fluosilicate; and that the surface on which the poison is deposited is of strong significance inasmuch as guava as against citrus leaves showed significant differences. Both Natal fruit-fly and Mediterranean fruit-fly (*Ceratitis capitata*) which showed heavy incidence in the Rustenburg area over the preceding year, were mysteriously scarce over the past season, necessitating only occasional baiting.

Pests of Deciduous Fruit.

Codling moth (Enarmonia pomonella).—Near Pretoria a preliminary test was conducted with a view to the judicious combined use of insecticidal spraying and the encouragement of locally available parasitic and predatory insect enemies of the pest. The full spray programme consisting of 13 standard applications was tested against a reduced spray programme consisting of 4 sprays. Both programmes retained the first two applications.

The results in the two cases showed no difference, both giving about 59 per cent. clean fruit, whereas the control (untreated) gave 63 per cent. clean fruit. Whilst the efficacy of the full spray programme was admittedly poor as locally applied, the results of the test seem to indicate that the expense of 9 spray applications might perhaps be avoided without additional crop loss. Whilst further work is needed to confirm these points, the tendency indicated is of decided interest. Incidentally, it was observed that non-toxic larval bands constitute an important aid to parasites and predators of the pest.

Fruit-sucking moths (mainly Achaea lienardi).—From February to June 1947 the coastal districts from the Gamtoos Valley to East London sustained considerable damage to soft fruits. During the same period the larvae were recorded from the Transkei and Waterval, Transvaal, as defoliating wattle plantations. *Meloid* beetles (*Decapotoma* sp.) were generally troublesome in the eastern Cape Province on the blossoms of deciduous fruit. The use of 5 per cent. D.D.T. powder gave good control, though this is a questionable practice in so far as honey-bees are concerned.

Pests of Stored Products.

Stored grain pests are being accorded general attention from Potchefstroom. A watch is being kept over pest incidence in elevators. A special assignment over the past year was the investigation

of imported maize of a condition predisposing it to weevil infestation. A special pamphlet has been prepared on the important subject of insect pests of agricultural seeds.

From Rosebank (Cape) considerable attention was given to pests of stored fruits, sweets and tobacco. In the latter connection *Ephestia elutella* remains a serious pest of leaf tobacco (Turkish) in the process of curing. The complex has been traced to acorns as a link in the host chain and the problem now seems nearer solution, provided that both storehouse and the new crop is cleansed of infestation at the critical stage.

In the dried-fruit line there is a strong move towards the general installation of facilities at all important storage centres for methyl bromide fumigation as a routine measure. This is a healthy development. Incidentally, the same process for export fruit, subject to codling moth infestation, mainly apples, is being more widely used.

Forest Insects.

Eucalyptus snoutbeetle (*Gonipterus scutellatus*).—The control of this pest by the reported parasite *Anaphoidea nitens* is gradually approaching clarity after twenty years of balancing and attendant observation. Briefly, the control is well stabilized at the lower altitudes, whilst problem areas exist at higher altitudes. Even here, however, at least 50 per cent. control is attained in the worst areas. In effect, where at the outset 31 species of *Eucalyptus* were severely attacked and 35 only slightly, at present only 3 are attacked, and slightly at that. The factors influencing the situation are now under analysis. Briefly, altitude and rainfall and particularly low temperature at the higher and drier altitudes seem to be the dominating factors. They affect the parasite through host abundance by way of tree condition. Incidentally, these problem conditions have profoundly altered the local life history of *Gonipterus* from that evidenced in its Australian homeland.

Pine European moth (*Nudaurelia cytherea*).—Outbreaks have been recorded by the Department of Forestry.

Pine browntail moth (*Euproctis terminalis*).—The only remaining infestation is at Jessevale, Transvaal, where 300 acres are badly infested.

Wattle looper (*Achaea lienardi*).—Besides wattles, also *Pinus patula* and *Eucalyptus saligna* have been severely damaged in the Transvaal. In the Transkei an apparently permanent habitat of the pest has been located in indigenous Cape ebony forests (*Haywoodia lucens*). The ecology of the pest is receiving close attention from Cedara.

New poplar defoliator.—A Saturniid caterpillar (*Lobobunaea* (?) *epithyrena*) (first record) has severely damaged *Populus deltoides* in the Piet Retief area.

Wattle bagworm (*Acanthopsyche junodi*).—Ecological studies over many years have comprised all plantations in 30 selected estates over the entire wattle area. At present the pest is severe on 100,000 acres—the most extensive heavy incidence on record. Last year's treatment of foci (1,100 acres), though effective as regards local control, fell short of the main objective for various reasons which are understood but surmountable, and therefore does not alter the

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basic soundness of the scheme. This year some 2,200 acres are to receive aerial dusting. Benzene hexachloride (3 per cent.) is inferior to cryolite, but a higher concentration promises more satisfactory comparison. Benzene hexachloride smoke was ineffective against 4th instar larvae, but holds promise if applied on the 1st and 2nd instars.

Wattle froghopper (*Lygidolon laevigatum*) is susceptible to D.D.T. smoke, but *Bythoscopus cedaranus* is resistant. Investigations are continuing.

Timber Pests.

The European houseborer (*Hyltruppes bujules*) continues to show up very seriously in Cape Town and Port Elizabeth, as survey work proceeds. As regards the pre-treatment of timber, various methods are available which promise full structural if not complete permanent protection. *In situ* treatment of infested buildings, whilst less perfect, is nevertheless satisfactory in practice and a concerted effort towards drastically reducing the local beetle population to the general good is readily possible and long overdue. Considerable light is gradually being thrown on the biology of the beetle both at Port Elizabeth and Cape Town. The flying period is November to March with the main peak during December-January. The adults live from 2-4 weeks. Females lay about 70 eggs each on the average, usually in two batches. The average larval period at Cape Town is 1 year 320 days. The minimum larval period is 12 months. New timber appears to be preferred and constitutes better nourishment towards rapid growth and maturity than old timber. The larvae appear to flourish normally in suitable timber under temperature and humidity conditions typical of the interior of the country. This fact points towards vulnerability of our inland areas to infestation.

The powderpost beetle (*Lyctus brunneus*) is still seriously in evidence but definitely on the downgrade as is to be expected after the return of standard non-susceptible timbers.

The furniture beetle (*Anobium punctatum*) is very seriously in evidence in all types of timber, including floorings and furniture in the coastal and subcoastal areas. The Anobiid beetle *Mecobium* sp. (a new record and undetermined) is causing serious damage near the Natal coast, affecting both furniture and flooring.

The tropical drywood termite (*Cryptotermes brevis*) has within recent months been shown to have reached alarming numbers in Durban. Although known since 1921, the damage caused by insects used to be on a relatively small scale. Unfortunately during the war years, when specific vigilance against developments was impossible, the geometric progression of colony numbers, all inside the timber, reached very serious proportions, so much so that local authorities, municipal and national housing, are taking active steps towards the protection especially of new structures by suitable pre-treatment. The Division regards this menace as much worse than *Hylotrupes* because the pest attacks both hardwood and softwood, and attacks structural timbers, furniture and fittings with equal readiness. For this reason rigorous regulations are under active consideration with the object of stemming the danger. A new record from Port Elizabeth has just been announced. This greatly increases the seriousness of the pest as the susceptibility of all the temperate portions of the country is definitely indicated.

Pests of Field Crops.

Maize stalkborer (*Busseola fusca*).—The main development in control is the utility of D.D.T. powder which is finding considerable popularity amongst progressive farmers. Excellent results were obtained in a whole-farm demonstration (500 morgen) where 5 per cent. D.D.T. powder was applied to the entire crop. Two-and-a-half per cent. powder has been shown to be equally effective and the indications are that even $\frac{1}{2}$ per cent. will be strong enough. The latest recommendation is to treat all plants. For simplicity, treatment is carried out when the plants are 18-24" high, irrespective of the time of first infestation. This saves infested plants and protects all clean ones up to tasseling stage. The requirements for an average stand are 10 pounds per morgen at 6d. per lb. (for 5 per cent. strength). Dilution of the powder at home is readily feasible.

Complete eradication of local infestation has for the first time shown up the influence of untreated maize in the vicinity, which causes late crop infestation in treated maize. This is not always serious and is habitually ignored. It seems, however, preventable by communal effort which should handsomely repay the effort.

Black maize beetle (*Heteronychus sanctae-helenae*).—For two seasons this insect has caused serious damage to potatoes (and to a lesser extent maize) on the highveld, but towards the end of 1946 exceedingly severe local damage to maize in the north-eastern Orange Free State (Frankfort, Heilbron, Villiers) was witnessed. Both larvae and adults attack the young maize stands, but planting time coincides with the peak emergence of adults which cause the main damage. In various infested lands two successive plantings were wiped out in the same season and a crop could only be realized by planting teff, sunflowers, buckwheat, cowpeas or some such non-susceptible crop. This heteronychus is essentially a grassland insect and feeds on grass roots and humus. In Pretoria it is a bad pest of lawns such as bowling greens. It seems to favour well-watered, well-drained soils. Its heavy incidence in the Free State in November-December 1946 is thought to be the result of unusual concentration of larvae through the lateness of the season's spring rains, resulting in an unprecedentedly heavy and protracted adult emergence. Field observations throughout 1947 to date predict another adult peak about the same time, but apparently the numbers on the same farms are not so large at present. Much information has been gained on the life history of this insect. Control measures are mainly cultural, consisting of the breaking up of pupal cells of the pest by ploughing and discing whenever they occur prior to planting. Chemical measures, in case they are needed, are also promising. Benzene hexachloride powder applied lightly to the soil surface is highly toxic to the insect.

Maize tassel beetle (*Astylus atromaculatus*).—The adult is often very abundant on maize tassels. It does little immediate damage, but the larvae, which follows as hairy brown worms, $\frac{1}{2}$ inch in length, are very destructive to maize seed in soil, especially heavy black soil or the Transvaal highveld. For seed protection, 5 per cent. D.D.T. powder mixed with the seed in the planter bin (2 lb. per 25 lb. seed) appears to give very good results. Adults are readily killed by 5 per cent. D.D.T. powder.

The Adoretus beetle (Adoretus tessellatus) at times does serious damage to maize foliage. Control does not appear to be an economical proposition.

Maize aphid (Aphis maidis) was prevalent early in 1947 on maize, but is essentially associated with drought. Plant vigour appears to be the best and only remedy.

Maize sheath disease.—The causative agent, the jassid *Cicadulina mbila*, has been shown to be present in small numbers throughout, early-infested plants serving as foci of infestation for later ones until the whole field may be infested and rendered unproductive.

The potato-tuber moth (Phthorimaea operculella) causes serious damage to the eyes of potatoes stored in the open for maturing and greening; grass covering used to give some protection but the recent open-crate method causes serious exposure. Light treatment with D.D.T. dust (5 per cent.) gives protection by killing developing larvae but does not affect the adult moth.

The lucerne caterpillar (Colias elctio) has been shown to be readily controllable by dusting with cryolite at 25 lb. per morgen. Dusting in a quiet atmosphere is advisable. Around Uppington damage seems to originate from larvae hibernating in the crowns. Near Pretoria these could not be found, but adults hibernate in sheltered spots.

Black peach aphid (Myzus persicae) on tobacco.—Recent tests with insecticides (Rustenburg) indicate that 0.5 per cent. benzene hexachloride dust and 5 per cent. and 10 per cent. D.D.T. dust give results much superior to those obtained with 40 per cent. nicotine sulphate (1.600). The D.D.T. has, moreover, a residual effect 13 days after treatment. D.D.T. spray emulsion (0.2 per cent.) is somewhat more effective than dust. The kill is slow, seldom 100 per cent. within 48 hours, but very striking after 96 hours.

Chicory Pests.

The dull-black surface beetle (Gonocephalum simplex) was found to be readily controlled by Cedara cutworm bait. The defoliating caterpillar *Plusia orichalcea* did severe damage to chicory seedlings at Bathurst. Good control was achieved with 5 per cent. D.D.T. dust.

Vegetable Pests.

Pumpkin fly (Dacus vertebratus).—In tests at Nelspruit, benzene hexachloride at 0.005 per cent. concentration worked outstandingly well in bait in the shade (untried in sunlight). It was established that this fly feeds well on the dried (sugary) bait in captivity.

Plant Nematodes.

Heterodera marioni.—For the control of eelworm in seed-beds, silver chloride dissolved in sodium cyanide was again tested against carbon bisulphite and chloropicrin together with the newer fumigant D.D. (1,3 dichloropropylene, 1,2 dichloropropane). The silver ions were disappointing, chloropicrin was good, CS₂ excellent, and D.D. excellent.

The last-mentioned has been applied on a field scale in a test towards the commercial cleaning of land of eelworm, a special applicator attachable to a plough being used. Results will be taken over the next three years. At Nelspruit, D.D. was found to be promising

against eelworm in vegetables at dosages of 400 lb. per acre and upwards—this quantity tending to be uneconomical except for seed-beds.

Crop-rotation methods (long range) against eelworm receive constant attention. The season's observations hold out no new hopes. The organic matter trial (heavy applications) is definitely disappointing and shows no decrease in eelworm infestation at all.

Pratylenchus pratensis, a nematode new to South Africa, has been found in potatoes near Witbank, Transvaal.

Termites.

In respect of species of Termitidae (ground termites or fungus growers) affecting wooden structures and buildings, good progress is being made in co-operation with the National Building Research Branch of the Council for Scientific and Industrial Research towards inculcating national termite protection measures into the South African building code.

For the eradication of these termite species, especially *Odoterpes badius* and *Macrotermes natalensis*, and also species such as *Termes latericius*, a new method has been developed in the form of toxic smokes, mainly of benzene hexachloride and D.D.T. basis. An article on the subject appeared in *Farming in South Africa*.

In the line of soil poisoning for the protection of trees, posts, sub-floor spaces, etc., a comprehensive series of tests embracing the use of lead arsenate, calcium arsenate, pentachlorophenol, copper sulphate, D.D.T. and benzene hexachloride are in progress near Rust der Winter.

Against the ordinary anthep termite *Trinervitermes havilandi* as a destroyer of grazing, extensive field tests have been conducted with a view to the eradication of colonies. Explosives are successful but the cost is 3.3d. per mound, which is too high. Fragmentation of the mound, followed by excavation, is difficult to practise dependably. Shaving off mounds by tractor power, followed by either excavation or the application of medium solvent naphtha, gives excellent results at reasonable cost. The insecticide costs about 0.9d. per nest and only inhabited nests, more or less 1 in 5, need be treated. The whole scheme applied to a 14,000-morgen farm, part of which has a maximum infestation, with a total infestation estimated at 228,000 mounds, is estimated to cost 1s. 8d. per morgen on an average. The main cause of phenomenal increase of mounds appears to be overgrazing.

Harvester Termites (*Hodotermes* spp.).—Farmers have recently approached the Department for the issue of locust bait (mealiemeal base) against harvesters. Whilst this request has been granted, it should be emphasized that the use of this bait is not a Departmental recommendation, the bait being much too fine for the insects to gather. Grass cuttings suitably poisoned are the correct bait.

Army worm (*Laphygma exempta*).—During the year under review small scattered outbreaks were recorded in February from Ermelo, Bethal and Brakpan (Transvaal); Mkuzi Game Reserve (Zululand); and eastern Swaziland, along the Umbeluzi and along the same river over the Portuguese border in Portuguese East Africa. On the highveld the infestation was on teff lands, and elsewhere on veld grass.

Insect Parasites.

Efforts at the Pretoria and Grootfontein laboratories towards biological control of the *Karoo caterpillar* (*Loxostege frustralis*) have reached a further stage in so far that the egg parasite *Chelonus texanus* has been fairly well distributed over the past year over the main affected zone, excluding mainly the northern areas where locust poisoning operations render this work unprofitable at present. Close on 1½ million parasites bred in the Parasite Laboratory in Pretoria have been liberated at strategic points to spread further on their own power. To complete the parasite complex it is intended to introduce three more species on a large scale, these comprising species which attack the larval and pupal stages of the pest. These parasites are already known to take to the pest but are next to impossible to breed in large numbers, for which reason mass importations from North America have been planned for, and are already commencing. It should be made clear that this importation is purely for strategic distribution. No results should be looked for until these relatively few thousands of the various species have increased locally to many billions, when they may, it is hoped, commence to exercise an influence on infestations over thousands of square miles of territory. There is no certainty of success but it seems worthwhile putting the scheme to the test.

The Parasite Laboratory is continuing its investigations into the habits of blowfly parasites and the competition between blowfly species.

Effect of D.D.T. on Indigenous Insect Populations.

In the Mkuzi Game Reserves where the Division of Veterinary Services has repeatedly sprayed and smoked a large area with D.D.T. insecticide, observations are being continued on the mass effect of these treatments on the natural local insect fauna. On account of the difficulty of identifications of these wild insects, a great many of which may be new to science, it will take a long time to complete and subsequently analyse the records. A great mass of information is, however, accumulating. There are surprises in many directions, many species showing high susceptibility whilst their nearest relatives are virtually immune and others again showing resistance where high susceptibility was expected. Species of wild flies have been strongly affected as to numbers, but, on the whole, little permanent effect on identifiable elements of the population seems to be in evidence. Certain species were knocked out badly but seem to be filtering back gradually from the margin of the untreated areas so that a serious upset of the general balance seems unlikely. Certainly there have been no mass outbreaks of plant-feeding species relatively non-susceptible to D.D.T., as may have been possible had the natural enemies of these species, which include numerous small species of hymenoptera, in general very susceptible to D.D.T., been eliminated by the insecticide.

Insecticide Investigations.

Much time has been spent in developing and testing insecticidal smokes using D.D.T., benzene hexachloride and Velsicol 1068 as the active agent. A great deal of chemical work in which the co-operation of the Division of Chemical Services was enlisted, was

involved, particularly in respect of the burning mixtures and their adaptation to the quantities of insecticide required. Basic investigations into the behaviour of the smoke deposits have indicated that horizontal surfaces retain effective films much longer than vertical surfaces and that smokes in general are much less satisfactory on oil-painted than on other types of surfaces.

Tests continue on initial and residual toxicities of smokes, dusts and sprays on a variety of types of surfaces. In general, benzene hexachloride shows exceptionally quick-acting knock-down properties, but, like Velsicol 1068, is not anywhere near D.D.T. for residual effect. All three suffer badly on oil-painted surfaces. Investigations continue. Studies on particle size of D.D.T. dusts indicate that the smaller the particle the better. Sabadilla insecticide is being tested. Initially it appears by comparison to be superior to 5 per cent. D.D.T. both in speed and final result. Various lines of investigation towards finding new insecticides are in progress. In tests against red spider, benzene hexachloride and Velsicol 1068 have proved ineffective, whilst dinitrocyclo-orthohexylphenol and its di-cyclo-hexylamine salt, dynone, give excellent results though these tend to scorch vegetation. As a test insect, *Trinervitermes havilandi* is used. Because most workers use *Musca domestica*, a comparison of the two is being made on a critical basis to test the comparability of results. Thus far the indications are that, whilst the reactions of the two insects naturally differ, houseflies being more susceptible to D.D.T., benzene hexachloride and Velsicol, the relative toxicity of these three substances to each of the two insects appears to be of the same order. Much time has been given to routine testing of insecticides. Work on the biochemical background of insecticidal activities has been resumed on a limited scale.

National Collection and Insect Records.

Considerable progress is being made in the classification of certain families of Coleoptera. The identification work by the Imperial Institute of Entomology is progressing favourably and many new species and genera are constantly being added to the collection. The collection from the wholesale D.D.T. sprayings referred to above have occasioned excessive work for the section. It is evident that an abundance of new material is involved.

Amongst the more important records of the year may be mentioned *Pseudococcus filamentosus* (?) damaging jacaranda trees (probably weakened through drought) in Pretoria; *Tylococcus chrysocomae* damaging *Pentzia* bushes in the Karoo (mistaken for cochineal); *Orthesia insignis* on "daisy lawn" (*Lippia* sp.); *Aulacaspis pentagona* prevalent on peach around Pretoria; *Nodaria rufinotalis* damaging maize stalks at Rustenburg, and also attacking dry lucerne; *Apomecyna binubila* boring into cucurbit stems at Groblersdal; and *Acidodes leucogramma* on beans in the northern Transvaal (first record).

Apiculture.

Advisory work, mainly through correspondence and a few visits, and instruction through various short courses, has constituted the main programme of activities in this field over the year under review. Facilities for the provision of Italian queens to beekeepers are gradually improving.

Horticultural Problems: Research and Control Work.

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THE activities of the Division of Horticulture essentially concern all horticultural crops such as fruit, vegetables and flowers, and may be sub-divided under the following three headings, viz. (A.) Advisory, (B.) Research, and (C.) Inspection and Control.

A. Advisory Work.

Most advisory work is entrusted to special officers allocated to this work. These officers are also required to do a certain amount of research work, but their first duty is to attend to enquiries from farmers by correspondence or by visiting farms or addressing farmers' meetings. They are stationed in various parts of the Union and deal with all queries from their particular areas. So, for example, there are horticultural officers of the Division of Horticulture stationed at Pretoria, Nelspruit, Bathurst, Port Elizabeth, Joubertina, Oudtshoorn, Stellenbosch, Vaalhartz, Upington and Potchefstroom.

During the year under review about 2,800 farms were visited and approximately 13,000 letters were written and 22 articles published by officers of the Division. Furthermore, over 3,000 visitors called at horticultural stations for verbal advice, and officers addressed 69 farmers' meetings which were attended by a total of over 1,500 farmers. These figures do not include the correspondence by the essentially research staff nor the visits to farms by research officers in connection with their research projects. The activities of the fruit inspection section are also excluded from the above figures.

The demands being made on this advisory service are very great and difficulty is being experienced in coping satisfactorily with the requirements of the farming public.

B. Research.

Apart from work conducted by the horticultural offices at Port Elizabeth, Joubertina and Stellenbosch, research work is also carried out by officers stationed at the following research stations, namely:—

- Port Elizabeth, Joubertina and Stellenbosch.
- Pretoria Horticultural Research Laboratories.
- Onderstepoort Vegetable Research Station.
- Nelspruit Subtropical Horticultural Research Station.
- Bathurst Pineapple Research Station.
- Oudtshoorn Vegetable Research Station.
- Vaalhartz Experiment Station.
- Upington Experiment Station.
- Potchefstroom College of Agriculture.

Citrus.

Nutritional Studies.—(a) The main citrus fertilizer project at the Nelspruit Research Station, referred to as the „Long Term” or “Permanent Fertilizer Project” has yielded significant results for the fifth year in succession.

The results as regards yield differ from those of previous years in that phosphate is no longer the only limiting factor and nitrogen has now become a second limiting factor.

The influence of fertilizers on fruit quality was the same as in previous years, namely:—

- (i) Ammonium sulphate decreased the fruit size and the juice content and increased the acidity and rind thickness of Valencia oranges.
- (ii) Superphosphate and kraal manure gave the opposite effect to ammonium sulphate, having increased the fruit size and the juice content and decreased the acidity and rind thickness of the fruit.
- (iii) Potash fertilizers increased the acidity of the fruit.

Thus, on the sandy soil on which this experiment is being conducted, the limiting factor for the first twelve years of the life of the citrus trees has been phosphates, and during the thirteenth year nitrogen also became a limiting factor.

(b) In a supplementary citrus fertilizer experiment on the Nelspruit Research Station, with trees also planted in January 1935, ammonium sulphate, calcium nitrate, nitro-chalk, and kraal manure plus nitro-chalk, in each case plus potassium as potassium sulphate, are tested out against a superphosphate plus potassium sulphate "control" under two systems of cultivation, namely clean cultivation and green manuring. The results with regard to quality of crop are similar in this experiment to those obtained in the "Permanent Experiment". However, this year for the first time the beneficial effect of cover-crops on yield has become evident, thus:—

- (i) Plots receiving no nitrogen and no cover-crop are suffering badly from a nitrogen deficiency.
- (ii) Plots receiving no nitrogen, but with a cover crop, are yielding twice as much as those plots similarly treated, but without a cover-crop. Notwithstanding this increase in yield due to the cover-crop, such yields are still only about 80 per cent. of the crops from plots receiving inorganic nitrogen or manure.

(c) In certain investigations being conducted in the western Transvaal near Rustenburg, the form in which nitrogen is applied to citrus trees has been shown to be very important. Although nitrogen in the form of ammonium, such as ammonium sulphate, has been the usual nitrogenous fertilizer used, this form of nitrogenous fertilizer may, under certain conditions, have a very deleterious effect on the growth of citrus trees; the size and the quality of the crop are also adversely affected, the acid content of the fruit being very high and the rind excessively thick.

Many instances in the western Transvaal have been found where nitrification of the ammonium to nitrate is exceedingly slow. In such cases the ammonium ion as such is rapidly absorbed by the tree to the detriment of the tree and crop. Furthermore, such soils are naturally poorly supplied with bases, with the result that the ammonium nitrogen actually leaches out easily, contrary to the usually accepted view which assumes that ammonium nitrogen is not leached out of soils. In such soils where ammonium sulphate is used as a source of nitrogen, lime should be added to the soil prior to the application of ammonium sulphate. Alternatively, it is much safer for growers to use artificial nitrogenous fertilizers containing nitrogen in the form of nitrate, such as nitrate of soda or calcium nitrate.

HORTICULTURAL PROBLEMS.

The influence of the absorption of large quantities of ammonium nitrogen by citrus trees is also being studied in sand and water cultures under controlled conditions. The ammonium ion has been shown to have deleterious effects on the absorption of other ions necessary for normal plant growth, and also root growth is retarded very markedly.

(d) The development of a technique for analysing citrus leaves, with a view to diagnosing nutritional requirements, has progressed satisfactorily, with the result that there is reason for optimism for the eventual use of this method for quickly determining the fertilizer requirements of citrus trees. Already this method has made it possible to diagnose successfully various nutritional problems.

(e) In several projects it has been found that oranges from trees which have been heavily fertilized with nitrogen have a lower vitamin C content than oranges from similar trees semi-starved of nitrogen.

(f) No further positive information has been obtained on one of the most important problems facing the citrus grower in the eastern Transvaal, if not later the whole Union, namely that of "greening". After years of research it seems, by a process of elimination, that the cause of this malady approaches nearest to something virus-like. Its incidence has practically driven out the production of tight-skin naartjes, and now the loose-skin mandarin types are showing a considerable increase thereof. With oranges the incidence of "greening" appears to have remained static during past years.

(g) There are many smaller research projects dealing with citrus nutrition which need not be commented on here or mentioned in detail. A few of these include—

- (i) the examination of the cross-transfer of solutes from one side of citrus trees to the other;
- (ii) sand and water culture experiments dealing with physiological and nutritional problems of citrus;
- (iii) biological studies of citrus roots;
- (iv) organic versus inorganic fertilizers; and
- (v) the importance of trace elements under various soil and climatic conditions, etc.

Root and Rootstock Investigations.—Past reports have indicated the large-scale and comprehensive citrus rootstock projects which are under way. These investigations have now proceeded long enough to supply definite results on the suitability of various stocks for the main commercial citrus species. Good progress has been made with the statistical analysis of ten years' results on fruit yield and quality, and the first of a series of articles on the subject is being prepared for publication.

Water Relationships.—The trees comprising the orchard where the large-scale irrigation experiments are being conducted are of the same parentage and as uniform as possible. The main project which is being conducted on the Alkmaar Sub-station of the Nelspruit Research Station, comprises ten differential treatments replicated five times. The differential treatments are of too short duration already to expect significant effects, except that treatments involving a frequent wilted condition show a higher percentage of out-of-season fruit than others.

Breeding and Selection.—Every possible variety and species of citrus tree is imported from all over the world. As a result, the citrus variety orchard at the Nelspruit Research Station now contains

approximately three hundred varieties and species of citrus. Not only are these varieties tested out under different climatic conditions in South Africa, but the plant material is also available for purposes of breeding and selecting new and better varieties. So it has already become evident that there are a large number of different strains of the navel variety of orange grown in the Union; some of them differ so much in quality and characteristics that they could justifiably be given different names.

To these plantings have been added an orchard of sixteen mid-season orange varieties and twelve Valencia Late orange strains, all of these being grown both on sweet orange and on rough lemon rootstock.

Other Subtropical Fruits.

(a) The rapidly increasing economic importance of subtropical fruits other than citrus, resulting mainly from higher consumer demand and higher prices received, has necessitated more attention being given to problems in this field. A new Avocado Variety Orchard in which some fifty varieties on different combinations of West Indian, Guatemalan and Mexican stocks will be under trial, has been planted at the Nelspruit Station. With mangoes much attention is still to be given to technique and methods of vegetative propagation so that a wider distribution of the proved imported varieties can be made, but the greatest difficulties are still being experienced in obtaining successful results. A new Mango Variety Orchard has been started at Alkmaar in which it is being determined which varieties come true from seed, while seeds, seedlings, and budded trees have been distributed throughout the Union for area adaptability trials on private properties.

The variety orchards include approximately 60 varieties of avocados, 70 of mangoes, 30 of litchis, 40 of pecans and many miscellaneous fruits.

(b) The above variety collections are also to be used in connection with the breeding of new and improved varieties of fruits. The first outstanding new fruit variety produced at the Nelspruit Research Station is the "Hortus Gold" variety of papaw. Although it is now in commercial production and in great public favour because of its outstanding qualities, it is not yet a pure line and accordingly segregation is taking place in commercial plantings. Further inbreeding is being done and it is anticipated that within a reasonable time seed, which will come true to type, will become available.

(c) *Tung nuts*.—The rootstock trials with tung nuts, using essentially *Aleurites Fordii* and *Aleurites Montana*, have largely substantiated the results reported on earlier.

All Montana treatments far outyielded all *Fordii* treatments.

The Montana trees budded on Montana rootstock produced an average of 30 pounds of nuts per tree in their seventh year from planting in the orchard. The average yield of the seedling Montana trees was 23 lb. per tree, but, if only the female Montana seedling trees are taken into consideration, then the average per tree was 40 lb. of nuts.

Vegetable Production.

Many nutritional, varietal and other investigations have been commenced relatively recently. Nevertheless much information of immediate practical importance to commercial growers has already

become available. The activities of the Division in the field of vegetable production are expected to expand rapidly. A few projects which have already produced tangible results may be indicated.

Nutritional problems.—Many investigations dealing with the nutrition of vegetable crops are being conducted, but the data from this research are not yet available for publication.

Other Growth Problems of Vegetables.—(a) Samples of all vegetable seeds produced in the Union on a commercial scale are grown in test plots and are compared with each other and also with samples of imported seed. In this way not only is a comparison with the yield and quality of imported seed made possible, but the plant geneticists are also placed in a position to know where or whether improvement is necessary in the production of mother seed. Such trials are carried out in several different areas under different climatic conditions of the Union.

(b) Many investigations involving varietal trials, time of planting, thickness of planting, trellising, etc., are being carried out, and results of considerable commercial importance will be available soon.

Breeding and Selection of Vegetables.—(a) These investigations are confined at present essentially to the inbreeding of carrots, beetroot, spinach beet, tomatoes and egg-fruit in order to determine—

- (i) the length of period over which inbreeding can take place without seriously affecting quality, which in turn affects the Divisional policy laid down with growers who produce seed commercially by rigorous selection;
- (ii) how most important characteristics are inherited.

Furthermore, the breeding programme provides for making re-combinations of inbred lines with the object of maintaining or improving quality, uniformity and vigour. Already first and second generation inbreeding has made it possible to single out interesting types of carrots, spinach beet, egg-fruit and tomatoes. Collections of many different varieties and variant types of carrot, beetroot and tomato have been built up with the object of securing from natural hybridization the greatest possible character combinations to commence a large-scale statistical plant inbreeding and re-combination programme.

(b) Several successful crosses have been produced with peas in order to obtain earlier and more suitable varieties for the semi-tropical conditions of the eastern Transvaal Lowveld.

(c) On a limited scale mother seed of beetroot, peas, tomatoes and Lucullus spinach beet has been produced and has been made available to seed-growers for commercial seed production.

(d) Breeding work with tomatoes at the Nelspruit Research Station and at Pretoria has produced new strains which are very resistant to the bacterial wilt and to Fusarium wilt disease. These diseases normally cause great losses to tomato growers. Back-crossing and inbreeding is still progressing with a view to combining this relative immunity with a better quality commercial variety of tomato. One hundred and eighty-five varieties and selections of tomatoes are being used in this work.

(e) It has been found that beans of the Black Wonder and Black Valentine varieties are resistant to bacterial wilt. As these are, however, not good quality beans, they are being crossed with high quality varieties of beans with a view to combining in a new variety the characters of quality and resistance to bacterial wilt.

Pineapples.

Investigations in connection with pineapples are conducted mostly on the Pineapple Experiment Station at Bathurst, but also at the Nelspruit Research Station and on a co-operative basis on the farms of commercial growers.

Nutritional Studies of Pineapples.—(a) The main fertilizer trials at the Bathurst Pineapple Station afford a great deal of interest to commercial pineapple growers. Considerable differences in growth and cropping are noted from different fertilizer treatments, notwithstanding the fact that commercial growers in the area generally claim that they can get no response from the application of fertilizers. As the plants reach a more mature age, the differences in growth and production are becoming more marked.

(b) Trace elements, particularly manganese, are being found by leaf analysis diagnoses to be important in many pineries. Tests involving the use of manganese and other trace elements are in progress.

Pineapple Selection and Breeding.—(a) Forty-six named varieties of pineapples are still under trial at the Experiment Station at Bathurst. Many of these so-called varieties, which were imported, are similar in every respect to the two common local varieties known as "Queen" and "Smooth Cayenne". Of the imported "Queen" types, only the "Ripley Queen" shows promise of any superiority over the South African "Queen" pineapple. So far the Australian varieties of "Cayenne" (known as "Cayenne Zuill" and "Cayenne Q.A.S.") are bearing fruits with a single crown, this being a distinct improvement over the South African "Smooth Cayenne" variety which bears about fifty per cent. of its fruits with double or multiple crowns. Eighteen imported varieties have proved of no commercial value.

(b) The original selections of a superior quality strain of pineapple have been propagated, and plants have been distributed to interested growers for trial plantings under different conditions.

(c) Many crosses between "Queen" and "Smooth Cayenne" have been made. The seedlings are growing both at Nelspruit and Bathurst. Some of these seedlings are very promising and in due course new varieties will become available from these.

Deciduous Fruit.

Nutritional Studies of Deciduous Fruit.—(a) Large-scale fertilizer trials with a large number of varieties of deciduous fruit being conducted at the Vaalhartz Experiment Station have continued to show the necessity for applying phosphatic fertilizers in those areas for normal growth. Whereas nitrogenous fertilizers induced no positive results in the trees for a number of years, the trees are now showing signs of lack of nitrogen. Both phosphatic and nitrogenous fertilizers have now become essential.

Rootstock and Root Studies.—(a) The excavation of trees in the experimental orchards at the Vaalhartz Station has rendered very interesting data concerning the reaction of different rootstocks when budded to apricot trees.

Apricot trees on Marianna plum stock grew very much better than when budded on peach stock (Transvaal Yellow). The explanation for this appears to be the fact that invariably the Marianna root did not penetrate the soil deeply and spread mostly in the upper

2 to 3 feet of soil, whereas the peach root penetrated through into the sub-soil, striking the lime strata lower down.

(b) Apple rootstock investigations at Potchefstroom with the variety Rome Beauty on three stocks, namely Sweet Apple stock, Merton No. 793 and Northern Spy, have shown the following results:—

- (i) Trees on Sweet Apple stock are more vigorous than those on Merton No. 793, which in their turn are again more vigorous than the trees on Northern Spy roots.
- (ii) Trees on Sweet Apple stocks are more spreading in habit of growth than those on Merton or Northern Spy.

(c) Beurre Hardy pear trees on six different rootstocks and Bon Chretien on eight different rootstocks are being tested out in the Transvaal, in co-operation with the Western Province Fruit Research Station. Elberta peach trees are being studied at Potchefstroom when either budded or grafted on five different stocks.

Selection of Deciduous Fruit.—Various selections of the well-known Kakamas variety of canning peach have been planted out at the Upington Research Station for trial purposes. Not only is there a considerable difference in the various strains, but of particular commercial importance is the fact that strains are now available which ripen at different times.

Viticulture.

Most of the viticultural work of the Division is done along the Orange River, with the Upington Research Station as its headquarters. Officers for advisory work on viticulture are also available at Pretoria and Oudtshoorn.

It is estimated that along the Orange River there are more than 2,000 morgen planted to Sultana grapes. At Upington trials have been established and are proposed for the near future which will deal with all the important aspects of Sultana production, including nutrition, irrigation, pruning, trellising, rootstocks and drying methods for raisin production. Much of the existing trials, which were of a more exploratory nature, will then be discontinued.

Floriculture.

Although much of the Division's advisory work has to do with commercial floriculture, relatively little serious research work is being done because of a shortage of trained staff. One of the professional staff of the Division is now overseas to specialize in the study of commercial floriculture and its problems. Amongst the relatively few investigations which have been conducted on commercial flower farms, fertilizer and irrigation methods have been found to be of very great economic importance.

As is also commonly found with other horticultural crops to-day, trace elements are very important in the nutrition of many flowers. Physiological troubles such as "little leaf", mottling and chlorosis, due to deficiency of zinc or other trace elements, have also been found in flowers.

Seed Production.

The extensive programme for building up a seed production industry in the Union, commenced at the beginning of the last war, has continued to make very satisfactory progress during the year under review. South Africa is to-day very largely independent of imports for its vegetable seed, and other countries in Europe and Africa

are taking a greater and greater interest in South African vegetable seed. Not only have many enquiries been received from well-known big seed-houses overseas, but very large firm orders for South African seed have actually been placed by well-known overseas firms.

The registration and inspection scheme of the Division of Horticulture has made it possible to ensure to a very large degree that good seed is marketed, and as a result farmers have come to realize that certified South African-produced seed is of good quality. This, in turn, has had a marked influence on breaking down the prejudice which exists in South Africa, amongst South Africans, against South African seed.

Considerable progress has been made with the breeding of high quality mother seed for distribution amongst commercial seed growers.

C. Inspection and Control.

This report, in dealing with the 12 months under review, takes in :—

- (1) A complete deciduous-fruit season which normally commences in November and ends in June.
- (2) The latter portion of the 1946 and the first half of the 1947 citrus-fruit season. These seasons commence in April and end in November.
- (3) Dried-fruit exports for the 12 month's period ending 31 August.
- (4) Canned-food inspection.

(1) Deciduous Fruit.

The bulk of the deciduous fruit crop was again handled and controlled by the Deciduous Fruit Board.

In addition to the inspection of export fruit, this section also inspected the Board's fruit at Cape Town, Port Elizabeth and Durban, as well as at the following inland production centres, namely: Daljosphat, Ceres, Hex River Valley, Constantia, Groot Drakenstein, Paarl and Stellenbosch.

(2) Citrus Fruit.

The 1947 season opened with a complete return to pre-war organization, and inspection took place at the following centres: Lourenco Marques and all Union Ports; Citrusdal, Patentie, Kirkwood, Sundays River Valley, Grahamstown, Fort Beaufort, Rustenburg, Koster, Groot Marico, Zebediela, Letaba, Tzaneen, Elandschoek, Nelspruit, White River, Plaston, Karino and Muden.

Citrus fruit packed or pocketed for local markets was also inspected by officers of this section, prior to its despatch from inland production points.

(3) Dried Fruit.

The quantity exported during the period under review represents approximately one-fifth of normal pre-war exports.

During the period under review, exports to the United Kingdom were considerably reduced due to decreased production, which was barely sufficient for South African markets. Shipments to the United Kingdom and to East and West African ports consisted of a very wide range of products, but the bulk was made up of vine fruits, raisins, sultanas and currants, comprising 83 per cent. of the total quantity exported of 1947.

Shipments were made from, and inspection took place at, the ports of Cape Town, Port Elizabeth and Durban.

(4) Canned-Food Inspection.

The inspection and grading of all canned fruit, fruit juices, canned vegetables and jams packed at South African canneries has continued. During the period under review inspection took place at 23 factories in the areas of Cape Town, Paarl, Worcester, Port Elizabeth, Durban and Johannesburg. Inspectors have been stationed permanently at each of the abovementioned centres.

The total output of the factories, of goods subject to the Canned Foods Regulations, amounted to 50,000 tons for the first six months

Further work has been done on the development of more objective tests for determining quality and grade differentiation. It is hoped that the introduction of these tests will aid materially in assisting in the uniform interpretation and consistent application of the regulations.

Registration of Nurseries.

THE attention of nurserymen selling vines, trees and other plants which are not exempt from registration is drawn to the Agricultural Pests Act of 1911 and Regulation 2 of Government Notice No. 1793 of 1936, in terms of which such nurseries must be registered with the Department of Agriculture on or before 1 September of each year. In the case of nurseries not registered on this date, registration is subject to the discretion of the Department and such conditions as the Department may prescribe. The defaulting nurseryman may be required to pay the travelling and other expenses of the inspector who is to carry out a special inspection for the purpose.

It has been found that vineyard nurserymen are especially inclined to leave their applications for registration until late in the season, often until the inspection of their district has already been completed. These late applications have greatly hampered the work of the inspectors. Vineyard nurserymen in the south-western Cape Province are herewith notified that registration for this season will still be granted without payment of the travelling expenses of the inspector, provided application is made immediately. Applications received after 31 January, 1948, will in no circumstances be granted, even if the nurseryman is willing to bear the costs of inspection. Vineyards from which grafting wood is taken for the cultivation of grafted vines for sale, must also be inspected and therefore registered. Nurserymen intending to graft vines for sale and wishing to obtain grafting wood from another farm, must now apply for registration of the latter, if that has not yet been done.

Application forms for registration are obtainable from the Chief Inspector, Plant Regulatory Service, P.O. Box 513, Pretoria. These forms must be completed and returned together with the necessary registration fee which in the case of vines, is £2 per annum.

(C. P. van der Merwe, Chief Inspector, Plant Regulatory Service.)

Investigation of Plant Diseases, and Botanical Surveys.

R. A. Dyer, D.Sc., Chief Division of Botany and Plant Pathology.

Pathology Section.

Citrus Diseases.

THE most disquieting occurrence during the year was the spread of black spot (*Phoma citricarpa*). The disease has been known in Pietermaritzburg, Richmond, Umkomaas Valley and along the north coast areas. Now, however, it seems to be spreading rapidly, even in dry areas. A survey last year revealed a heavy incidence of the disease at Tzaneen in the Transvaal and at Muden, Otto's Bluff, Pietermaritzburg, Richmond, Umkomaas Valley and along the north coast in Natal. The disease was also found to a slight extent at Rustenburg and Barberton in the Transvaal. Not only have losses in the orchards been severe, but the disease has developed in transit to the coast; thousands of cases, which have been hand-sorted at Tzaneen to exclude any fruits showing signs of the disease, had to be rejected at Cape Town because of bad spotting. Spraying with Bordeaux mixture (2-2-80) gave good control of black spot, but injured the trees slightly.

Evidence is accumulating that certain abnormal conditions of citrus that have hitherto remained unexplained are due to virus infection. Citrus seedlings are being raised with the object of investigating these problems.

The value of proper systems of irrigation and of maintaining soil nitrogen at an adequate level for the control of *Diplodia gummosis* of citrus trees has again been demonstrated.

Cereal Diseases.

Recent research on *streak diseases* has shown that, like maize and wheat, barley is also very susceptible. Oats and rye, especially the former, are more resistant. Of the pasture grasses teff is very susceptible, while babala, red grass and sudan grass are apparently immune.

Experiments to obtain resistance in our commercial maize varieties have shown great promise and are being continued.

Kaffircorn false smut, a disease in which the fungus *Cerebella sorghi-vulgaris* is involved, was recorded in the Union for the first time.

Kromnek Disease.

Additional hosts showing natural infection of kromnek are continually being found. Amongst the more recent of these new records is lettuce. In an earlier publication on the host range of kromnek in South Africa, the absence of natural infection in lettuce was specially noted; this was surprising because in other countries where this disease occurs (under the name of spotted-wilt) lettuce is stated to be a common host. During 1946 and the early part of 1947 several examples of natural infection were observed in Pretoria. This observation removes any doubt that kromnek is identical with the spotted-wilt found in other countries.

PLANT DISEASE, AND BOTANICAL SURVEYS.

In further studies on kromnek, the causal virus in naturally infected hosts has been examined in some detail by transmission to certain differential hosts. The results of the tests show that more than one form or strain of virus is associated with the disease.

The results of two preliminary experiments to determine whether the disease could be reasonably controlled in tomato, by periodic applications of insecticides to the growing crops, were sufficiently promising to justify a repetition of an experiment on a larger scale during the coming season.

Potato Diseases.

Among the seedling lines obtained from overseas potato-breeding institutions, promising varieties have been obtained with resistance to *Phytophthora* blight and wart disease. One line from the Empire Potato Collection proved very resistant to *Alternaria solani*. The first crosses between varieties of the collection and local varieties were raised.

Tomato Diseases.

Two new varieties, Durbot and a selection raised at the Research Station, Nelspruit, have shown themselves highly resistant to Fusarium wilt. The resistance of Marvel has broken down.

Attempts to find a variety resistant to bacterial wilt are continuing.

Other Diseases.

Rotting of packed litchi fruits was found, in preliminary experiments, to be controlled to a considerable extent by using spergon as a disinfectant.

The losses of papaw seedlings during transplanting, as a result of infection by members of the *Pythiaceae*, were found to be reduced to very low levels by altering the time of sowing so that transplanting could be carried out during April and May when the soil is cool.

Mixed crops of maize and cucurbits to control cucurbit mosaic have given promising results.

Following the report of a serious virus disease of sweet potato from East Africa, an inspection was made of sweet potato in both the eastern and western Transvaal. What is thought to be the same disease was found on farms near Nelspruit and between Brits and Rustenburg. The condition proved to be transmissible to healthy plants by grafting. Further work on the disease is planned for the coming season.

A disease of cabbage and cauliflowers, characterized by the development of black rings and spots on the older leaves, was prevalent in the experimental plots of the Horticultural Division at Onderstepoort. The results of transmission tests to differential hosts identified this disease with virus diseases described in other countries under the names of cabbage ring spot and cabbage black spot. The disease appears to be of minor importance.

Two new virus diseases, one of yellow lupins and the other of sweet peas, and a disease of *Poinsettia* due to *Rhabdospora* sp. were recorded.

Plant Regulation and Inspection.

Wart disease of potatoes, *Synchytrium endobioticum*, has been discovered on the town lands of Belfast, Carolina, Hendrina and Ermelo, in addition to the areas reported last year (Wakkerstroom,

Volkstrand and Charlestown). The presence of this disease so near the centre of the Union's potato industry is disquieting, especially because susceptible varieties are most popular, but the usual quarantine measures have been applied.

A new case of infection of grape-vines by bacterial blight was recorded at Worcester. A total of nearly six million plants in registered nurseries and twelve million in vineyards was examined.

Five citrus nurseries, one in the eastern Transvaal and two each in the eastern and western Cape Province, were inspected for scaly bark (*psorosis*) under the scheme for the registration of parent trees. Routine examination of orchards for scaly bark continued, though at a greatly reduced pace, because of the calls on the inspection staff for other work.

Botanical Section.

Plant Physiology (Fauresmith Veld Reserve).

The Karoo plant *Pentzia incana*, normally an excellent fodder plant, was tested for feeding value under different veld treatments during drought. Grazed plants, cut plants and control plants were analysed for minerals and readily digestible carbohydrates (sugar and starch). It was found that the feeding value of *Pentzia* deteriorated rapidly in value during drought, due not to a reduction in minerals which remained high, but to the inability of the leaves to form starch or an appreciable amount of sugar.

The determination of sugar and starch in *Tribulus* and lucerne was continued. The presence of a haemolytic glucoside was studied in *Tribulus* in various stages of growth in different soils. A saponin present in mature plants, but not in seedling plants, decreases in drooping plants and disappears entirely in badly wilted and old plants. It was found that the stomach juices of sheep break down the saponin and liberate from it large quantities of sugars. Nitrate and nitrogen fraction determinations were done with *Pentzia incana* and *Tribulus*.

A joint investigation with research officers from Onderstepoort was done on the disease known as *enzootic icterus*, which appears to originate from a plant or certain type of veld. It was found that *Nestlera* spp. were common in the affected areas and a special study of *Nestlera* infested veld is being carried out near De Aar.

Veld damaged by flooding of irrigation water is still under observation.

Several bulletins on the results of experiments are in the press.

Botanical Survey.

The work of classifying and charting the main veld types of the Union was continued. Particular attention was paid to completing in detail the unsurveyed portion of Natal and Zululand, southern Orange Free State and eastern Cape Province as far west as a line drawn roughly from Willowmore to Douglas. The eastern Cape Province shows complicated transitions between three main vegetation types; the south-western "fynbos", the Karoo flora and the eastern grass and bushveld. Further complications are added by the extensive encroachment eastwards of the Karoo vegetation and the marked spread of thorn scrub. A detailed study of these veld

changes and interactions will be made by the Botanical Survey Officer now stationed at Grahamstown.

The following special ecological surveys were made in conjunction with other Divisions:—

- (1) Ecological surveys of locust oviposition sites and sites avoided by locusts in the De Aar and Prieska districts, in co-operation with the Locust Administration.
- (2) A report on the progress made by vegetation on the farm Rietkolk Oos, Williston District (presented at the request of the Division of Soil Conservation and Extension).
- (3) Several reconnaissance surveys made together with officers of the Division of Economics and Markets in connection with their delimitation of agro-economic zones of the eastern half of the Union.

Plant Introduction.

Forty-two samples of seed (mostly grasses and fodder plants) received from overseas, and 207 collections of indigenous plants were handled by the Prinshof Experiment Station, Pretoria. Particular attention was paid to collecting seed of possible fodder trees and indigenous legumes useful for fodder or soil-conserving purposes. Yield and palatability trials were continued with the grasses and legumes previously introduced and tests were made in co-operation with Onderstepoort concerning the digestibility and feeding value of three of the most promising legumes, namely: red clover (*Trifolium pratense*), Berseem clover (*Trifolium alexandrinum*) and *Glycine javanica*.

Veld Reserve, Worcester.

With the return from military service of the Officer-in-Charge, the work of the Reserve was resumed. Observations on plant succession under different treatments were continued, and nursery plots were built up with a view to producing seed of the bushes and grasses best suited to the area. The clay-coated seed method of re-vegetating veld is being further investigated and four co-operative experiments with farmers were initiated in the Villiersdorp district.

Systematic and Economic Botany.

The National Herbarium at Pretoria and the three regional herbaria, namely, the Natal Herbarium (Durban), the Albany Museum Herbarium (Grahamstown), and the McGregor Museum Herbarium (Kimberley), continued the work of classifying specimens, and about 10,300 such specimens were mounted and filed.

The National Herbarium received collections from several territories outside the Union, viz. Uganda, Angola, Nyasaland, Tanganyika, Belgian Congo, Portuguese East Africa and Northern and Southern Rhodesia.

On the research side, progress has been made with an account of the Fauresmith flora, which is being prepared for publication and which will include the description of several new species and a check-list of the plants.

A study of the living plants in the genus *Encephalartos* in the wild was made with a view to revising the genus, and about five new species are being described.

Research work has also been done on African orchids and *Crinum* species.

Agricultural Education and Research.

H. W. Turpin, Ph.D., Director of the Division of Agricultural Education and Research.

MANY of the farming problems of the Union arise through the application of systems not well adapted to the environment in which they are applied.

This is not the result of a definite attempt by the farmer to farm contrary to the laws of nature—it is more often the result of other circumstances, e.g. economic pressure, preference for a particular crop or breed, lack of farming and, finally, lack of specific information regarding systems best suited to the environment.

The activities of the Division are centered around the latter two aspects and are aimed at improving the educational level of the future farmer by means of the courses offered at its agricultural colleges, and at obtaining through the research stations spread over the country, scientific data regarding farming systems best adapted to specific environments.

If the report on research work is studied carefully, it will be evident that the basis of the Division's research work is an attempt to develop farming systems better adapted than those applied at present.

Climatological research on cattle provides excellent guidance in regard to the types most likely to thrive under different conditions. The work on sheep and wool has a similar object. An innovation which should be of practical value in this work, is the appointment of a full-time climatological research officer.

The inclusion of so-called unit experiments at every station is an attempt at giving farmers a direct demonstration of better systems (not necessarily final) than those at present applied by them.

Research in connection with pastures and crop production is directed primarily at developing more suitable methods of utilization and better plant species for each environment.

Staff.

During the year, the Assistant Director (Agronomy), Dr. A. R. Saunders, was appointed Director of the recently established Natal Agricultural Research Institute at Pietermaritzburg. The resulting vacancy has not yet been filled. Mr. G. S. Maré was appointed Assistant Director (Animal Husbandry) of the Division. Dr. John Fisher, Principal of the Agricultural College, Cedara, retired and Mr. H. H. Cornell was promoted to the post.

I. Agricultural Education.

A total of 268 applications were received for the Junior Diploma course, 1947. There were 87 applications from ex-volunteers, 148 from civilians in the Union and 33 from applicants outside the Union. Enrolments totalled 152 for the Junior Diploma course of 1947 and 101 for the Senior Diploma Course, making a grand total of 253 students for the diploma courses at the four Agricultural Colleges for the year.

Prospects for 1948 are as promising as in 1947 but the same problem remains, viz. that a relatively large number of applications will have to be rejected. The following table shows the number of

AGRICULTURAL EDUCATION AND RESEARCH.

applications for the Junior Diploma Course for 1948 as at 30th June 1947.

College.	Applications (Union).	Applications (from outside the Union).	Total.
Cedara.....	35	46	81
Glen.....	29	5	34
Grootfontein.....	30	—	30
Potchefstroom.....	43	8	51
TOTALS.....	137	59	196

The maximum accommodation available is for between 150 and 160 students. Ten per cent. of the accommodation is reserved for students from outside the Union, viz. from Rhodesia, South-West Africa, Swaziland and other territories outside the boundaries of the Union. This means that 15 or 16 students from abroad and approximately 140 Union students can be enrolled. Seven months prior to the commencement of the course it can, therefore already be stated that the accommodation at the agricultural colleges will be inadequate.

Interest in the other courses held during the past year was very satisfactory to strong. Details of these courses are given in the reports of the agricultural colleges concerned.

The prospects for agricultural education at the colleges are good. During the past two years very little propaganda was made and little advertising done in connection with the Two-year Diploma Course in General Agriculture because it would be undesirable to create a demand which could not be satisfied.

Reports from Colleges.

The reports on the work and activities of the Colleges appear at the end of this report.

II. Research.

Sheep and Wool.

Merino sheep have lately been fairly severely criticised in certain parts of the Union, mainly because of their susceptibility to blowfly attacks, their smallness and lack of constitution and their low fertility. The causes of this disfavour were generally not understood. The sheep breeding and feeding experiments conducted at Grootfontein have already established facts of considerable value in formulating a sounder merino-breeding policy, the aim of which will be the breeding of improved types of merino sheep—animals able to make the best possible use of the cheapest feed, viz. the veld.

In about 85 per cent. of all cases, blowflies attack the crutch of the sheep, and since this pest constitutes one of the most difficult problems of the Merino sheep-farmer, the breeding of a less susceptible type must be considered of great importance. Superfluous skin development on the body is unnecessary; since even without it, a high level of wool production can be maintained.

Feeding is of major importance in the development of the young merino sheep. The first period in the lamb's life up to the time of weaning, is the most critical but the whole of its first year is of

real importance. It has been found that the difference between so-called "stud" and "flock" ewes is largely due to the standard of feeding during the lambing stage.

The development of hardy, fertile types of mutton sheep by crossing Southdown and Dorset Horn rams with Blackhead Persian ewes is of special importance to those parts of the country where non-woolled hardy mutton types are kept. The new types produce mutton of a higher quality, their fat is less localised, they are early maturing and, if allowed to replace the poorly fleshed and unimproved non-woolled types, would considerably increase the rate and quality of the country's mutton production.

The merino provides a good basis for the production of halfbred ewes on irrigated pastures (lucerne in summer and wheat in winter) and, for the purpose of this crossing, rams of the Horn mutton breeds give best results. This type of crossbreeding is not recommended for general farming purposes unless feeding conditions are very favourable. On veld, the above-mentioned type of halfbred ewe cannot compete with the merino.

Animal Husbandry—Nutritional Research.

The development of agriculture in South Africa in so far as the cultivation of more suitable nutritional crops in the various regions is concerned, together with changing conditions and shortages of certain nutrients, is creating numerous stock-feeding problems which demand urgent and extensive research in the field of animal nutrition; valuable work is already being performed at the various institutions.

This Division has for several years been studying the nutritional value of South African hay and pasture crops at Potchefstroom where tests are also being carried out to determine the influence of roughage in various forms and quantities on the production and composition of milk. Studies are also being conducted in connection with the use of roughage for the economical production of baconers and to determine to what extent proteins in young lucerne and winter cereals can replace concentrates in pig rations.

Nutritional experiments with dairy cows, pigs and beef cattle are under way at Vaal-Hartz, Döhne, Estcourt and other experiment stations. Special attention is being paid to the utilization of feeds produced under those conditions.

Climatological Experiments.

The climatological experiments with cattle at the Mara and Messina experiment stations, are being continued.

Special attention is devoted to methods of selection, which will contribute to the development of types better suited to certain ecological conditions.

In this connection, a large mass of data is being collected on the various types of hair covering, and their felting qualities.

A study is also being made of hide thickness and other hide characteristics which may influence the adaptability of cattle. The climatological work is directed mainly at the increasing production by improving the adaptability of animals in specific areas. The work includes ecological studies and the collection of data with a view to the proper regional classification of cattle breeds in South Africa.

Breeding for the modification of types within the breeds in order to achieve greater adaptability to the sub-tropics is also receiving considerable attention. For this purpose a smooth-coated

Hereford type is being bred at the Mara Experiment Station. Selection is also applied to decrease the breed's susceptibility to eye diseases caused by the intense solar radiation.

In the adaptability studies much time is devoted to the collection of data on the ability of cattle breeds and types within the breeds to make effective use of natural grazing in the semi-arid areas.

In the pure-bred Afrikaner herd selection is being continued very successfully with a view to making the animals tick-repellent, and encouraging rapid growth, reasonably high milk production and fertility.

The perpetuation of a cross-bred type consisting of $\frac{1}{2}$ Afrikaner and $\frac{1}{2}$ exotic beef breeds is also progressing although relatively slowly.

Poultry Research.

Most of the poultry research work is concentrated at the Potchefstroom College of Agriculture. It is proposed to devote more attention to this aspect of the industry than has been the case in the past.

The Division also intends making greater use of the egg-laying competitions as a source of research. An officer is already stationed at Glen to devote his full attention to the analysis of the records of the Glen Egg-laying Competitions of the past 10 years. Valuable data regarding eggs, egg quality, composition, differences in breed, continuity in breeding, etc. could be gathered at an egg-laying competition.

Although most of the basic as well as practical research will be concentrated at Potchefstroom, research for Natal on related practical problems will, in view of climatic differences, in the course of time be undertaken also at the agricultural college at Cedara.

In the western Cape Province poultry research is being conducted at the Stellenbosch-Elsenburg College of Agriculture.

Horse-breeding.

Generally, the postwar interest in horse-breeding was well maintained during the past year.

Several municipalities purchased draught horses. Institutions under the control of this Division not only keep studs of draught horses but at the same time apply measures for a more intensive use of brood mares for general farm work.

Interest in good riding-horses has grown considerably and this type is to a large extent the main attraction of each show. This fact is a favourable sign and strongly encouraged the general use of horses on farms. As a result, established horse-breeders recently imported eleven American Saddle-horses at very high prices. For the first time in the history of horse-breeding in the Union, nine registered mares of that breed were imported; these should contribute materially to the improvement of our light breeds of saddle and harness horses.

With regard to mule-breeding, the export market which had paid so well during the war years, has slumped. U.N.N.R.A. agents have obtained their requirements and prices have fallen. Ruling prices range from £15 to £38, which still makes it a paying undertaking. Another jack was recently imported from the United States for the improvement of the Department's donkey stud. Unfortunately the wellknown jack "Joe Louis" which rejuvenated donkey studs in South Africa, died recently at the age of 14 years. The donkey breeders have founded an association for the supply of jacks for mule-breeding, and the Department will breed only stud animals of high quality.

The Horse Improvement Scheme is now in its ninth season. More than 1,600 mares have been served to date, and the scheme is appreciatively supported by horse-breeders.

Agronomic Research.

Agronomic research is more than ever necessary to solve the numerous problems underlying the rebuilding and preservation of the various branches of our agriculture. In view of this, steps were taken to tackle the most important and fundamental problems by means of the closest co-operation between research institutions within certain areas.

The influence of annual and perennial crops on subsequent crops, and the value of methods of soil cultivation for the maintenance and improvement of soil fertility and structure, are basic problems now receiving attention. Special attention is also being paid, especially at the Vaal-Hartz Agricultural station, to the irrigational needs of crops and to the slope and width of plots. At Potchefstroom, plant breeding and improvement of the most important agricultural crops to aid in stabilising production, is still being intensively studied, and good progress has been made with the establishment of a hybrid maize seed industry.

Reasonable progress is being made in tobacco research at Rustenburg where extensive research facilities already exist. In collaboration with the Division of Botany and Plant Pathology our own virus-free mother seed-potato industry is being established for which purpose the Riet River and Döhne Agricultural Research Stations are used, especially the former. In this way South Africa could become independent of imports from overseas. Good progress has already been made in this connection. A new research station was established at Bethlehem this year to conduct research on agricultural problems of the north-eastern Orange Free State and the eastern Transvaal highveld—a long-felt necessity. The activities of the seed testing station at Potchefstroom and the application of the Fertilizers, Farm foods, Seeds and Pests Remedies Act are expanding and good services have already been rendered. Further seeds will shortly be proclaimed under the act.

Pasture Research.

There is a growing realization of the necessity of research in connection with soil utilization and soil conservation. This kind of research is of an individual nature and differs from purely specialised and analytical research since its aim is to incorporate well-known facts regarding pasture crops and husbandry in soil utilization systems, in which the soil will remain the constant factor.

This phase of research can therefore be regarded as synthetic rather than analytical, but it is in every way as important for effective planning in farming.

The large number of veld-control experiments started several years ago, are being continued and are still yielding valuable results.

Further progress has been made in pasture research by the fodder-tree nurseries established in the various research areas. About 10,000 trees of various kinds have already been planted at each of these places.

Research in connection with seed production and seed harvesting shows considerable increase. Experiments are being laid down throughout the country studying the effect of sowing methods, quantities of seed, cultivation methods, application of fertilizers, etc.,

AGRICULTURAL EDUCATION AND RESEARCH.

on various indigenous grasses. Approximately 15 tons of seed of indigenous grasses was collected during the past year and will now be used for these experiments.

The establishment of indigenous grasses on cultivated lands for production purposes is also in progress in various research areas. Exotic fodder plants are being systematically imported and tested.

Progress has been made in unit-experiments, mainly at Athole, Estcourt, Tabamhlope, Döhne and Rietvlei. The possibility of producing high quality feed without impairing the quality of the soil, through veld control and the development of established pastures in crop cultivation systems, is becoming more apparent.

Research in the Karroo has revealed the serious deterioration of the grassveld during the past century. This deterioration may be due to unfavourable climatic changes. Consequently, it is felt that a critical research must be conducted on present-day climatic conditions, climatic conditions in the past and present climatic changes.

The problem of sheep kept on the veld now appears to be more difficult than that of cattle on veld. Attempts are now being made to tackle this problem.

Fibre.—Due to the serious bag shortage experienced in the Union, an intensive research programme has been initiated regarding measures which could be taken to alleviate the position, and with Government support, for example, a private body has undertaken and nearly completed the erection of a bag factory at a cost of approximately £500,000. Until the Union can supply the necessary fibre, supplies are being imported from the Belgian Congo.

In the Union itself experiments have been conducted by the Government for the past seven years in connection with fibre production from sunn hemp and New Zealand hemp (*Phormium tenax*). Seven hundred morgen have already been sown to the latter fibre plant in Zululand and this area will shortly be extended when more plants are available.

During the past year, intensive studies were made of Deccan-hemp (wild stockrose) and all available information was obtained from other countries, e.g. Russia, Brazil, India, Java, Cuba, etc., who are already growing it commercially for fibre production. This is a wild plant growing in the warm areas of the Union; it produces a large percentage of excellent fibre suitable as a substitute for jute. Quantities of the seed from the wild plant have been gathered, and during next year extensive experiments will be undertaken in collaboration with farmers of the low-veld in the eastern Transvaal. Approximately 400 morgen are being planted and rotting tanks and decorticating machines are being erected at Nelspruit by a private firm. If this proves successful, the plant will be cultivated on a grand scale also in other parts of this country. Many problems still, however, beset the enterprise and in the meantime research in connection with suitable fibre plants, e.g. ramie, sunn hemp, etc., is being continued. Economical decortication constitutes the main problem. Machinery for decorticating bark fibre plants is still imperfect and annual removal of the fibre is a costly procedure unless labour is extremely cheap and abundant as in India and China. The problem is receiving serious attention and it is hoped that a satisfactory solution will be found within a reasonably short time.

Reports of Agricultural Research Stations.

The reports on the work and activities of the research stations appear at the end of the reports from the Agricultural Colleges.

Agricultural Research Stations.

(1) Rietvlei.

The activities at Rietvlei were concentrated mainly on the development of soil utilization under different degrees of intensity. Good progress was made in technique.

Valuable results have already been obtained with all the experiments concerned. It was found, for instance, that Napier grass is capable of yielding large quantities of silage material of a high quality if planted in rows about 5 ft. apart. The soil between the rows is ploughed and cultivated and in good years excellent supplementary crops can be obtained. This year eighteen rows of high quality silage were obtained from 6 year old Napier grass planted in this way.

Setaria kazungula species also showed that large quantities of hay could be obtained. These grasses were also found to thrive very well when planted together with the perennial legume.

Glycine javanica.—The grass enables the Glycine to trail along the stems. Masses of feed can be produced with a large degree of certainty from these perennial fodder crops.

The problem of establishing these perennial crops within a short period can be solved to a large extent by planting grass roots every second to fourth row on an already established maize or bean land, 4 to 6 weeks after germination of the seed. The grass then becomes established in the shade of the harvest crop and apparently has no detrimental effect on the crop. By the next season the grass will have become thoroughly established and able to yield good crops.

During the past season about 10,000 fodder trees were established from seed in a fodder tree nursery. This work was started during the past year. Various methods of propagation, transplanting and planting out, budding and grafting are being investigated.

Various methods of sowing and establishing grass seed were also investigated in order to determine the most profitable utilization of grass seed supplies for the establishment of artificial pastures and the reclamation of damaged veld. During the past year excellent germination and growth were obtained on all plots where the soil surface was firmly rolled after the grass seed had been sown. The usual type of roller seems to be too light and sowing seed in furrows (3 ft. or further apart) seems to promise greater success. Make the furrows along the contour with a heavy plough in such a way as to turn over the earth uphill. The soil can then be compacted by running a vehicle or a tractor with rubber tyres in the furrows. The space between the wheels should determine the space between the furrows. During the past year thatch grass was established in this way and an excellent cover was obtained after only three months.

Veld-control experiments were continued. It is hoped by means of these experiments to make it possible for stock to obtain their full feed requirements from the veld, throughout the year. Experiments where sour veld is grazed during the growing season only, are being continued. A new experiment to determine the influence of shelter on steers was begun during the past year.

Grass-seed production and research showed considerable expansion during the past year—not only in respect of indigenous grasses, but also in respect of imported grasses and clovers.

(2) Losperfontein.

The dairy-farm unit experiment is well under way. A number of years will have to elapse, however, before any accurate conclusions can be made. The cultivation, treatment and utilization of fodder crops under these specific conditions are being investigated further. Two herds of Jerseys and Frieslands are at present being used in the experiment.

The experiment with the immunization of high-quality heifer calves against heartwater was successfully continued on a further 56 calves which were acquired. Although the general mortality was high, losses as a result of heartwater have so far only been about 5 per cent. from a grand total of 135 calves. Three deliveries of a total of more than thirty immunized calves have already been made to the Department of Lands.

A herd of 15 adult Jersey cows and two bulls was transferred here in September 1946 and immunized in the same way (but with another heartwater strain). Three of them succumbed to heartwater. The immunization against heartwater was also extended to lambs and so far the results are very promising.

Practical methods of tick control in the dairy herd with insecticides such as D.D.T. and others, with the elimination of the usual method of dipping, have been applied with considerable success.

The possibilities of large scale seed production from the fodder and/or grazing crops, Kudzu and Glycinea are being investigated in such a way that the suitability of these crops for grazing purposes can be determined at the same time. Glycinea showed a good seed production last summer and the area is now being expanded. So far, it has not been possible to obtain any seed from the Kudzu.

The cultivation of Napier grass was also begun and in due course this grass will be tested out as a grazing and fodder crop under irrigation.

(3) Rustenburg and Hartebeespoort.

Tobacco Experiments.

At these two research stations special attention is given to problems encountered in the cultivation of tobacco. At present the research work is, for the greater part, carried out at Rustenburg and the propagation of desirable types of seeds at Brits.

A study is made of sound cultivation practices, soil fertility, rotational cropping, control of insect pests and plant diseases, etc., in connection with tobacco as well as other crops which may play some part in the area.

In a varietal experiment in which the suitability for flue-curing of 13 tobacco varieties was tested out, Amarelo was found to surpass various promising Orinico varieties as regards yield. This finding is supported by those of previous seasons. As regards income per morgen, a variety bred by this research station was found to be the best. The quality analysis showed that certain Orinico varieties have a better quality than Amarelo.

The espacement experiment with Amarelo (flue-cured) originally planned to obtain a good stand, in spite of damage by kromnek, again showed that a closer espacement, such as 1 ft. apart in the row, considerably increased the yield both as regards weight and value. The improvement resulting from a 3 ft. by 1 ft. espacement as against 3' x 2', was 28.4 per cent. On the other hand,

closer espacements had a somewhat adverse effect on the quality of the leaf. Kromnek did not occur and consequently its influence on treatments could not be determined. The narrower espacements had no effect on the occurrence of other diseases.

Experiments to determine the effect of espacement on the nicotine content of the two tobacco varieties, Rustica and Madole (snuff tobacco) again showed that the weight as well as the total nicotine yield per morgen are considerably improved by closer espacements. The Rustica variety, with its much higher nicotine content, surpassed the Madole variety in nicotine production per morgen.

The breeding programme includes selections of varieties and crossings between varieties suitable for flue-curing; light and dark air-curing; snuff; cigars and nicotine; and resistance to mosaic and eelworm. The most promising selections are taken up in the varietal experiments and the poorer varieties eliminated.

Eelworm in Tobacco Beds.—Very promising results were obtained with D.D.T. and carbon bisulphide (CS_2) against eelworm in tobacco seedbeds. According to the results, D.D.T. seems to be a very promising remedy, being considerably cheaper than CS_2 .

A test was carried out to determine the resistance of five different tobacco selections to eelworm. No difference in resistance was noticed. For the control of seedbed pests, the efficacy of various powder mixtures was tested out. Promising results were obtained with 5 per cent. D.D.T. powder against both chewing and sucking insects.

Groundnuts.—The average yield per morgen of five Spanish groundnut varieties is 6,024 lb. of groundnuts (unshelled), and that of three Virginian varieties only 4,373 lb. of groundnuts (unshelled). The best Spanish variety, viz. Improved Spanish, yielded 6,340 lb. and the best Virginian variety, viz. Virginia Bunch, 4,940 lb. of groundnuts (unshelled) per morgen. Groundnuts tended to grow better and yield more in the red alluvial soil than in the black turf soil. Moreover, the latter type of soil is inclined to adhere to the shells when the crop is harvested.

Fertilizing Experiments.—From the results of an experiment on different methods of fertilizing, it is evident that the planter method not only adversely affects the germination of maize, but also yields a poorer crop than the band, broadcasting or row methods of application. There was no significant difference in the results given by the latter three methods. No difference in yield was effected by increasing the quantity of fertilizer from 250 lb. to 1,000 lb. per morgen. Only in the case of the planter method did an increase in the application per morgen result in diminished seed germination.

Maize resistance to Streak Disease.—Further progress was made with the breeding of maize resistant to streak disease. The most resistant strains showed a very light infection, whereas commercial varieties showed from 60 to 70 per cent. infection. As regards yield, the Robyn had the highest grain yield in spite of its 70 per cent. infection. Potchefstroom Pearl yielded 2 bags of maize less per morgen than the resistant variety which in turn was surpassed with Robyn with 4 bags per morgen.

Excellent yields were obtained with velvet-bean varieties specially bred for hay production, and it would appear that the velvet beans can play an important part in the farming system of this area.

Other Experiments.

The nut-grass experiment which is being carried out at the Hartebeespoort Research Station, has reached its final stage and interesting results have been obtained. A very favourable result was obtained by deep ploughing during the winter months, whereas practically no result could be obtained from summer smother crops. Despite a fairly serious occurrence of nut-grass, a good maize crop could still be obtained with normal cultivation.

Green manuring.—Favourable results were again obtained with sunn hemp as a green manuring crop. To date no favourable result has been obtained with any cereal green manuring crop on the wheat yield despite the fact that about 25 to 30 tons of green material per morgen was ploughed in.

The ley experiment is still being continued and the importance of a good rotational cropping system without a grazing crop is becoming more manifest. The choice of a summer grazing crop for cattle, however, still presents a problem. Except for babala and velvet beans no other suitable crop has been found.

Wheat.—As regards wheat crops, it was once more clear that Punjab and two other compound crosses produce the best yields. Punjab is already being recommended to farmers and is yielding good results. The latter three experiments were also carried out at the Hartebeespoort Research Station.

Seed Production.—Tobacco, wheat, oats and sunn hemp seed was grown and is being made available to farmers. About 27,000 ounces of tobacco seed have already been sold.

(4) Towoomba (Warmbaths).

The shortage of professional staff necessitated the partial suspension of technical work during the year.

The co-operative grazing experiments suffered in consequence, since they could not receive the necessary attention. The research work at the Station was, however, carried out according to schedule and promising results were obtained.

The past year has been the driest experienced since the establishment of the Experiment Station in 1934. The rainfall was 42 per cent. below the average for the area.

Grazing research in the northern Transvaal consists mainly of two groups, viz. veld control and veld reclamation.

Veld-Control Experiments.—The experiments were sub-divided into three groups, viz. annual grazing during the same season, rapid rotational grazing throughout the year and delayed seasonal grazing.

To date, most veld-control grazing experiments have shown no noticeable retrogression, some of them yielding good results and being so effective that the experiment oxen are continuing to show an increase in weight. At the same time, the grazing is still lasting out and there will be sufficient grass to carry the animals for a few months longer under present conditions.

Veld-reclamation Experiments.—The experiments were sub-divided as follows: reclamation of old lands and reclamation of damaged natural veld and veld overrun by shrubs and bushes.

Very little progress was made with the reclamation of old lands, since it is extremely difficult in this dry, hot part of the country to cultivate grasses which will thrive under varying climatic conditions. Most of the old lands are also overrun by couch grass, a grass which still seems to be the strongest pioneer grass thriving under local conditions and which even ousts other cultivated crops.

Much work has been done in the reclamation of damaged natural veld, but it was found that the shrubs and bushes on the veld have to be eliminated before the veld reclamation is possible. The expenses attached to the elimination of bush are very high and further experiments will therefore have to be carried out in connection with the control of bush in these parts where it has become a menace.

Nursery.—The nursery was kept in good condition and during the past year special attention was given to the cultivation of fodder and leguminous trees.

Various methods were tested out for propagating the following types of trees: Carob (*Ceratonia siliqua*), Mesquite (*Prosopis juliflora*) and Driedoring (*Gleditsia triacanthos*).

Other trees such as *Parkinsonia aculeata*, "olienhout" (wild olive) and tree lucerne are also being cultivated and tested out.

Grass-seed Production.—Renewed efforts were made to prepare lands for the cultivation of suitable grasses for seed production. Unfortunately most of the Towoomba cultivated lands are so overrun by couch grass that it will be some time before the soil will be ready to be planted to grasses; nor will sowing for seed production be possible for some time to come.

Compost.—Considerable quantities of waste material are collected annually for the manufacture of compost. The compost cages or pits in use here, are constructed in large hollow cement bricks. By admitting more air into the pits these hollow bricks expedite the rotting process. The temperature generated by the rotting material indicates when it is necessary to turn over and water the compost in the pits. In summer the process lasts from 4 to 5 weeks but during the cold winter months the period required for rotting is considerably longer.

Eradication of Gifblaar and Gousiektebossie.—These two poisonous plants annually cause considerable stock losses in the bushveld of the northern Transvaal. Unfortunately, owing to the inadequate staff, no work was done in this field during the year.

Hay and other fodder crops.—The hay yield was very disappointing this year, only about 25 per cent. of the normal yield having been obtained. The very severe Cochineal infestation in the cactus plantation led to a decision to saw off the trees fairly near ground level and feed them to draught animals. In this way a considerable saving was effected in other succulent feed which could then be fed to milch cows.

A piece of land put under irrigation produced a considerable greenfeed yield the following winter.

General.—As a result of the drought during the past two years, the vegetation was very limited and the grazing less plentiful than in normal years.

It would appear as if leguminous thorn trees in the veld this year yielded more pods than in normal years. The yield of 50 white-thorn trees (*Acacia Litakunensis*) were collected and weighed. The weights varied from 8 to 58 lb. per tree, with an average yield of 16½ lb. per tree. The pods of the fragrant *Acacia benthamia* were also collected and weighed. The yield was considerably poorer than that of the above-mentioned trees, viz. 3 to 20 lb. per tree with an average of 8½ lb. per tree.

More intensive research work will be carried out in future to determine the nutritive value of various pods, the average yield which can be expected per morgen under prevailing conditions, and methods of collecting and preserving pods.

(5) Mara and Messina.

The Mara Agricultural Research Station, 12,000 morgen in extent, is situated 30 miles due west of Louis Trichardt and is representative of the semi-arid subtropical bushveld regions characterized by sweet grass and mixed grazing and suitable for extensive farming.

At this station research is undertaken with a view to solving problems of animal husbandry similar to those occurring in this region. The problems are mainly those associated with adaptation, selection for fertility and productivity.

The Messina Experiment Farm, 14,000 morgen in extent, is situated in the hot, semi-arid lowveld of the Northern Transvaal. The environment of the experiment station makes it ideal for research on the climatological reactions of cattle with a view to throwing more light on methods of selection.

Experimental Work Done.

The selection experiments were continued with good results. The numbers of cross-bred stock have increased to such an extent that in future strict selection will be possible especially with a view to the improvement of beefing qualities, adaptability, fertility and longevity.

The breeding of the smooth type of Hereford is being continued. The station has had particular success with the immunization of Hereford heifers allowed to become naturally infected and treated with Uleron or Solupyrindine immediately they show a rise in temperature in the early morning.

The temperatures of all animals are taken daily in the early morning, i.e. at 6 a.m.

So few animals die of heartwater after the application of this method that it will be possible in future to introduce animals into these parts with a minimum of risk.

This year has witnessed the introduction of slaughtering tests on the oxen obtained from experiment animals with a view to determining the slaughtering qualities of the various types. The percentage of measles among the animals was so high that the human being can be eliminated as a possible source of infection and the question of infection through rodents will have to be thoroughly investigated.

At the Messina section the climatological work is being continued. Special attention was given to hides and hair and the possible part these might play in adaptation. The drought prevailing in large portions of the cattle farming regions has made possible the collection of interesting data on adaptability and nutritional requirements of various types and breeds of cattle.

(6) Athole (Ermelo).

The past year was characterized by the most severe drought on record since the establishment of the station. Instead of the normal rainfall of approximately 39 inches, only 26 inches were recorded. Foggy weather rarely occurred and conditions were ideal for the making of hay. Altogether about 360 tons of hay were made at the experiment station, most of which consisted of field hay. Due to the drought, most of the established grasses could yield only one cutting of hay.

Drought conditions have proved the meat-unit experiment, now in full swing, to be basically sound. In addition to the summer grazing supplied, the 100-morgen unit has also yielded more than 100 tons of hay just about one half of which consisted of *Acroceras macrum* hay. The Aberdeen Angus herd thrived exceedingly well under the treatment received in the experiment and although half the herd calved during winter, all the animals survived the winter, remaining in excellent condition without recourse to any feeds not produced in the experiment.

The milk-unit experiment also came into production during the year. Although the Jersey herd is not yet complete and some cows are not yet of the desired standard, it was possible to start milking.

The first cycle of the six-year rotational cropping system on the cultivated lands of this experiment, consisting of a three-year stand of *Paspalum urvillei*, and a one-year stand of each of the following: cowpeas, maize and root crops, was completed during the year. In addition to maize, cowpeas and turnips, 50 tons of hay were produced on the unit.

Preparations are being made for a certain degree of irrigation on the unit, mainly with a view to supplementing the protein requirements of the milch cows.

Established Grasses.—Plantings of *Acroceras macrum* and various *Setaria* species were extended considerably. The public is displaying increasing interest in these grasses and the demand for roots and seed is steadily increasing.

Grazing Experiment on Natural Pasture.—The results obtained with experiments on natural pasture show that this region is pre-eminently suitable for cattle grazing. Experiments with sheep were disappointing and where sheep alone were used, a deterioration of the veld was observed. Although the region is not suitable for exclusive sheep farming, no experiments have as yet been carried out to determine to which extent sheep may still play their part. It is intended next year to pay attention to this aspect of the matter. As regards cattle grazing, the system of quick rotation still remains the most successful. Continuous grazing by cattle, without proper control also results in veld deterioration and in erosion. A noteworthy feature, however, is that the process of deterioration is much more rapid when sheep are used than when the experiment animals are cattle.

It was decided to carry out more of the initial test work on imported grasses at Athole. For this purpose a large irrigation dam has been completed and a commencement was made with the laying out of extensive nurseries. Special attention will be given to the testing out of legumes since most of the known legumes fail in this region.

Experiments on grass-seed production were commenced this year and already interesting results have been obtained in regard to harvesting methods.

Soil-fertility experiments which include rotational cropping systems and various fertilizing methods, have thrown considerable light on the requirements of maize in this region.

Preliminary experiments with the planting of fodder trees were commenced during the year. It is a known fact that the oak and *Craefagus Pubescens* are promising varieties for this region. The latter in particular has a very hard seed and the present methods of starting their growth are unsatisfactory.

The station once more offered facilities this year to farmers in connection with the horse-improvement scheme, 18 mares having been covered by Percheron stallions.

(7) Estcourt.

The station continued with its usual work and experiments, except in the irrigation section where interesting results were obtained. The station is divided into three sections, namely the long-grass-veld, the busveld and the irrigation sections.

The rainfall for the period was 28·65 inches.

Longgrass-veld.—The veld-burning experiment proved the disadvantages of burning the veld as against cutting. The results were more striking during the rather dry year, when cattle had been grazing on the cut veld for three weeks before any of the burnt veld could be grazed.

The unit grazing experiment was continued as in previous years. Twenty-two steers are kept on 55 morgen, viz. 50 morgen of veld and 5 morgen of crops. Half the oxen are marketed annually at the age of from 2½ to 3 years, and the grading of carcasses at the abattoirs was as follows: three supers, seven prime and one grade carcase with an average dressed weight of 540 lb.

During the previous season there were four Shorthorn oxen in this experiment as well as the usual Afrikander × Hereford crosses, which proved once again that they thrive extremely well in this area in comparison with other beef types.

Owing to three successive dry years, the hay yield was only 600 lb. per acre in comparison with the usual figure of 2,000 lb.

Bushveld.—The system of treatment proved that it is possible for the veld to carry cattle the whole year. The veld is considerably improved by the following treatment: The 75 morgen in the unit experiment are divided into two sections; the steep ironstone ridges are grazed in winter, and the veld on the lower-lying slate in summer.

The summer paddocks are used in rotation so that one paddock is rested during the early summer whereas the other is rested during autumn. Each paddock is burnt every second year after the first rains. With this treatment thorn-bush encroachment was diminished by more than 90 percent in 3 years.

Irrigation.—Last season it was decided that crops would be irrigated only in order to keep them alive. That means that irrigation was minimized.

The result is that the weight of silage has increased to ten tons per acre in comparison with the two tons per acre during the previous year when irrigation was not so strictly limited.

In general, the previous season, i.e. the third dry year, proved that veld treatment and grazing management are very important in this area. The veld-burning experiment once again proved (a) the advantage of cutting the veld; (b) that veld burning should take place only every second year and even then not before the first rains of the season; and (c) the extremely harmful effect of burning in autumn or in winter before the rains.

(8) Tabamhlope.

In the area served by this station the reclamation of exhausted lands is of the greatest importance. Local soils are readily damaged by continuous ploughing, especially as regards their structure.

In connection with problems relating to soil fertility, experiments are being carried out with a view to—

- (a) determining what results can be achieved on exhausted lands and virgin soils by the application of varying quantities of compost and fertilizer, applied on the basis of an analysis of the compost;
- (b) determining the value of applying a standard amount of compost annually, double that quantity biennially, four times that quantity every fourth year or eight times the amount every eighth year (fertilizer applications on the same basis are being tested out);
- (c) determining whether the running of cattle or pigs on lands during winter is not more profitable than fertilizer applications;
- (d) determining whether green manuring instead of composting will enrich the soil economically;
- (e) investigating whether in contrast with a system of continuous monoculture, temporary pasture relays in a system of alternate cropping will increase the yield of subsequent crops;
- (f) determining whether, if pasture relays are beneficial, it would be economically profitable to maintain such pastures for one, two, three, four, five or six years before breaking them up.

It is as yet too early to expect results from the experiments. Amazing effects have, however, already been observed, especially the results of applications of compost on the growth and germination of crops. Applications of fertilizer have an injurious effect compared with compost applied on the same nitrogen-phosphorus-potassium basis. The problem is at present being investigated by the Division of Chemical Services.

Experience gained during this season and in previous years has revealed the necessity for thoroughly investigating the treatment of local soils. Virgin veld which is still in good condition, can be damaged through incorrect methods, methods of ploughing and subsequent treatment to such an extent as to exclude the possibility of economical returns for a considerable period. Crop production may even prove impossible in the first season. In view of the fact that these types of soil deteriorate so easily, the station finds itself in an excellent position to solve in the shortest space of time the problem of structural deterioration of the soil and the inclusion of artificial pastures in a rotational cropping system.

The station's programme has been drawn up accordingly.

A Unit Experiment.—As regards the 200 morgen unit experiment, the results obtained are being applied in a practical way in the intensive farming system for the area.

This unit experiment covers veld, lands and artificial pastures for an Ayrshire herd which is at present kept on the intensive section of the unit for milk production. The extensive section of the unit carries a beef herd. Pigs are being kept for building up soil fertility and for the retention of the manure value of their feed.

The feeding level of the area appears to be capable of producing three gallons of milk per day from cows fed on locally produced products. The cows received very little concentrates.

The 250 morgen of land obtained from the Division of Soil Conservation and Extension will be utilized for grass-seed production and grass-cover; exhausted lands will be planted to nutritious grasses and veld control experiments will be laid out.

The present research programme and the unit experiment together with extended work on grass, will yield useful results.

(9) Vaalhartz Agricultural Research Station.

Research.

(a) *Crop Production, Chemistry, Entomology.*—In all, 15 projects are under way and the laying down of 3 more and the cessation of one are contemplated for the coming year. Lack of concrete furrows for irrigating experiment plots is a handicap which demands remedying. The results were briefly as follows:—

- (i) *Winter Cereals.*—The best time for sowing appeared to be from the beginning of May until the middle of June. Wolbaard consistently yielded best, while Punjab and Lalkasarwali were almost as good. Breeding lines 45 W 2-6, 45 W 3-7 and 178 Q 8 compared well with Lalkasarwali. The experiment with oat varieties did not reveal any important differences.
- (ii) *Potatoes.*—Ulster Cromlech, Up-to-Date and Bliss Triumph yielded best for the September planting, while Katahdin and Ideal accounted for the highest yields in respect of January planting. Eelworm infestation was severe. Eelworm damage remains the most important problem in potato production. There is a distinct possibility that the success of the settlement will depend on the success achieved with the Spring production of potatoes, which in turn will be determined by the success attending eelworm control.
- (iii) *Groundnuts.*—The yield was low in comparison with that of previous years.
- (iv) *The Gradient Experiment.*—The soil gradients have been carefully restored and the technique is still being improved. Beds 12 feet wide have so far used more water than those measuring 18 and 24 feet wide, length and gradient remaining constant. The longer the beds and the lighter the gradients, the greater the quantity of water required for the irrigation.
- (v) *Eelworm Control Experiments.*—Results to date are not positive yet, but it appears that infestation varies from year to year.
- (vi) *Fertilizer Experiments.*—Very striking differences are being observed. Applications of both phosphate and nitrogen appear to be necessary and a stand of Sudan grass appears to have a harmful effect on the following crop.
- (vii) *Irrigation.*—The experiments with different quantities of irrigation water are continued, and, as in previous experiments, smaller quantities of water yielded slightly higher crops.
- (viii) *Lucerne Types and Varieties.*—Little, if any, difference is being found between Provence, Hunter River and Chinese, but seed received from different localities show considerable differences in yield and habits.

(b) *Horticulture.*—About 13 research projects are under way. Variety tests, fertilizer experiments, dates of planting and spacings show distinct differences. In the eelworm control experiments, treatment of the soil with D.D.T. yielded positive results in respect

of carrots but in the case of tomatoes the results were negative. The application of other materials had harmful results.

(c) *Animal Husbandry*.—Five projects are under way.

- (i) *Unit Milk-production Experiment*.—This experiment was transferred to Osblok during the year with a view to making it a closed unit. The average production of milk was 25 lb. per cow in milk.
- (ii) *Sudan versus Babala Pasture*.—In this experiment which did not involve the supplementary feeding of concentrates production per cow in milk averaged 28 lb. of milk. In the palatability tests the cows grazed the grass down completely before touching the Babala.
- (iii) *Pig-weaning Experiment*.—This experiment is being continued and shows that piglets can be weaned at an early age.
- (iv) *Vitamin Supplementary Feeding for Pigs*.—This experiment has just been started.
- (v) *Sheep Unit Experiment*.—The lambing percentage amounted to 75. Up to an average age of 109 days, the average gain in weight per day was 0.37 lb. per lamb. At this age the average weight of the lambs was 48 lb. The slow growth of the winter cereal pastures hampered the growth of the lambs.

(d) *Climate, Pasture and Production*.—The summer was exceptionally dry and hot and the veld made practically no growth. Outbreaks of lucerne caterpillar were severe and caused much damage. As a result of weather conditions, winter pasture crops initially made poor growth and lambing ewes and dairy cows were harmfully affected by the late growth since the desired winter pastures were not available in time. It appears that more use should be made of late-sown Sudan or Babala pasture during the period March to May.

From a concentrate point of view it may be desirable to sow barley-wheat and hull-less oats, or even rye, in preference to ordinary barley and oats.

The rations of animals in production already contain so much fibre that it appears undesirable to feed still more in the form of concentrates.

(e) *Field Day for Farmers*.—A field day for farmers was held at the research station and the attendance was gratifying.

(10) Riet River Experiment Station.

The activities of this Institution in conjunction with the work of the local Riet River Settlement, are focussed on the production of virus-free seed potatoes. This station serves as a centre where seed potatoes, which have been tested and rogued for virus diseases (including virus X) are grown in isolation and multiplied to a stage at which tuber stocks can be issued to the local settlement for one or two multiplications, after which supplies are issued to various seed potato growers' associations for replacing, partly at least, imported stocks.

During the past year, however, no potato material was cultivated on the land of the research station itself, the development and transformation of a piece of bare plain into research land having taken up the entire programme. A few canals were constructed and a piece of land can now be brought under irrigation. It is

intended to plant about one quarter morgen with 1,000 to 1,500 large tubers in September, 1947—these stocks have once again been tested by the Division of Botany and Plant Pathology for freeness from virus diseases. These tubers, which consist mainly of the Up-to-Date variety will have to be multiplied during several seasons before seed potatoes can be issued by the Research Station.

In September, 1946, about 5 morgen were planted to virus-free material. Roguing of possible undesirable material has been strictly applied and in spite of the unfavourable climate the yield was large enough for once again planting 40 morgen in January, 1947. All plantings were checked and rogued two or three times. The yield of almost 5,000 bags were disposed of as follows: 500 bags were planted again for supplying members of the local seed potato growers' association with seed in January, 1948; 4,000 bags were sold to seed potato growers' associations in consultation with the Secretary of their Union; and about 600 bags (tubers weighing more than 5 ounces) were exported to Uruguay.

Reference should also be made to the success achieved in the treatment of fresh potato tubers to induce sprouting. Lifting the crop began in the first week in January, 1947, and after having been subjected to chemical treatment, the tubers were planted again from the last week in the same month. Taking into consideration all factors, a most satisfactory stand was obtained. The dipping method used required a solution of 2 per cent. to 2½ per cent. ethylene chlorohydrin. Most of the tubers were cut for planting.

(11) Dohne.

During the past year the rainfall was still below normal, but conditions were better than during the previous few seasons.

Grazing Research.

Some of the field experiments in progress since 1940 have now yielded the desired information and the closing of some of these experiments and their replacement by new ones is being considered. The new experiments will be based mainly on data obtained from the old experiments.

Established grazing is used with a view to the provision of hay, silage, winter and summer pasturage. Owing to its manifold uses and qualities, *Setaria sphaecelata* (Kazungula and Kabulabula varieties) has now gained a permanent place as an established crop in these areas.

Extensive series of experiments on more effective establishment, maintenance and cultivation of perennial grasses, have been planned for the coming season.

Setaria Kazungula yields from 4 to 6 tons of hay or 34 to 42 tons of silage material per morgen. Out of 1½ morgen of *Setaria Kazungula* 1193, 455 lb. of seed were harvested; approximately 7 tons of hay of an inferior quality could still be made from the plants themselves, while the aftergrowth yielded excellent grazing for ewes with lambs.

A 70 ton silage pit could be filled from 2½ morgen of Napier fodder (half of which was established during the same season). Here too, the aftergrowth provided late summer grazing for cows with young calves and cows in calf. Clovergrass mixtures on dry ridges were an utter failure this season, but where irrigation could be applied and along the coast where good winter rains fell, these mixtures gave good results.

Field-Husbandry Research.

Silage was successfully made from Babala alone, or mixed with soybeans. Good silage was also made from Napier fodder. Both Babala and Napier fodder yielded from 30 to 35 tons of silage material per morgen. The cultivation of dryland lucerne is particularly successful with an application of 2 tons of agricultural lime per morgen. This crop should play an important rôle in the feed programme.



FIG. 1.—Napier fodder ready for silage.

Potatoes.—Virus \times -free seed planted here for seed-potato production, still showed no signs of deterioration after three generations. Various treatments with thio urea and ammonium thio acetate were applied with the object of finding a suitable treatment which will allow all the eyes to sprout simultaneously, and thus make possible the production of smaller seed potatoes for seed.

Sheep and Wool.

Management Experiments.—(a) Mortality in sheep lambing in spring is much higher than in ewes lambing in autumn. Moreover, if the ewes lamb in autumn (March and June) 28 lb. of wool per morgen per year is produced, whereas 18 lb. of wool per morgen per year is obtained from ewes lambing in spring.

(b) Fifty per cent. more lambs are raised and 29 lb. of wool are produced per morgen per year if sheep have free access to mineral lick, in comparison with 23 lb. of wool per morgen if the sheep receive no lick.

(c) If sheep are treated regularly for internal parasites, 26 lb. of wool are produced per morgen whereas only 18 lb. of wool are produced per morgen if they do not receive any treatment.

(d) From March to May summer crops and aftergrowth on established grasses provide sufficient grazing for ewes with lambs. Winter crops provide sufficient grazing during the early winter and during spring, while tubers (turnips and mangold) provide most feed during the driest winter months.

Breeding Experiments.—(a) In an experiment in which the aim is to breed a mutton merino type suitable for the sour grassveld areas, promising results are being obtained. The ewes lamb more easily than pure merino ewes, and during the past season 92 per cent. of the ewes lambed. The lambs attained a live weight of 80 to 120 lb. at the age of eight months. For the past year the wool production per ewe was 8·15 lb. greasy wool or 3·70 lb. scoured wool, while merino ewes produced 8·87 lb. greasy wool or 3·88 lb. scoured wool. This work is still in the initial stage.



FIG. 2.—*Setaria spbaecelata* at Dohne.

(b) Half-bred German merino ewes and $\frac{3}{4}$ -bred Southdown-Persian rams are used for the production of fat lambs. Such lambs reached a live weight of approximately 60 lb. at the age of 4 months. For the successful production of such fat lambs, a considerable amount of winter feed is necessary.

Cattle.

Milk-production Experiments.—(a) During the eight summer months of the year milk is produced without any concentrates. The summer veld is supplemented by dryland lucerne, *Setaria* (1193) and Napier fodder. Cows graze on these for three hours a day and are then run on the veld for the rest of the day. In the veld the cows graze in rotation in a three-camp system. Each cow requires 1·5 morgen of veld, and 7·5 morgen of established pastures provide supplementary feed for approximately 30 cows in milk. From October to May the cows produce from 20 to 30 lb. of milk per day.

(b) Cows receiving Babala silage produce 19·5 lb. of milk per day per cow, whereas cows receiving the same amount in weight of mixed Babala and soybean silage, produce 22·0 lb. of milk per day per cow. Cows fed on potato-Babala silage produce 21·3 lb. of milk per cow per day. Potato silage is made by throwing the cut Babala and whole potatoes in alternative layers into the silage pit. Potatoes comprise approximately 20 per cent. of the silage by weight. Only damaged and low-grade potatoes were used for this purpose.

(c) In an experiment in which Red Poll cows are milked twice per day and the calves hand reared and where the cows are milked only once a day and the calves suckled for half the day, it is found that the percentage of butterfat of cows which suckle their young is particularly low. Cows milked twice a day yield 4,208 lb. of milk and 165 lb. of butterfat with 3.92 per cent. B.F. in 300 days, whereas cows milked only once a day yield 2,257 lb. of milk and 54 lb. of butterfat with 2.29 per cent. B.F. in 300 days.

Meat Production System.—On 70 morgen of land half of which is under cultivation, 50 beef cattle (10 cows with their progeny) and 50 halfbred ewes with their lambs are kept. This veld and the cultivated lands must furnish the requirements for summer grazing as well as the requirements for the overwintering and fattening of the animals.



FIG. 3.—Ewes and lambs on mangold.

Fat lambs attain a live weight of 60 lb. at the age of approximately 160 days. Young cattle attained a live weight of 450 to 480 lb. at the age of 15 months.

Rotational grazing in a system of four camps is applied to the veld during summer. *Setaria*, Napier fodder and lucerne grazing are used to supplement the veld during summer.

Overwintering of Dry Cattle.—A maintenance ration for dry cattle is provided by 17 lb. of Babala silage and 10 lb. of Babala hay.

The live weights of the cattle indicate that finely cut Babala hay is not utilized any better than uncut hay.

(12) Bathurst.

The most severe drought in the history of the coastal belt lasted until almost the end of March. Although water supplies ran very low on many farms and gave in on some, the underground water supply at the station remained steady. If large numbers of the cattle had not been transferred to other stations during the spring, matters would have been very difficult. Fortunately a good quantity of silage was made which helped considerably to tide the animals over. Here we have another instance where the maize crop would have been lost, had silos not been available. The crop was on the point of drying out, when it was used for silage.

Pig Experiment with Sweet Potatoes.

Owing to the drought and the staff shortage, only the pig experiments on sweet potatoes were continued. These experiments were directed mainly at the maintenance of soil fertility and the destruction of weeds, especially of nut-grass.

The pig digs out the sweet potato by itself, at the same time destroying the nut-grass. Thus, by keeping twenty pigs per morgen for two months, the soil is fertilized considerably at a profit. The sweet-potato experiment has been in progress for only six months in the rotational system for the application of good soil utilization. The piglets are run on the lands at weaning age and sold as baconers as soon as they attain a live weight of 120 to 130 lb. (i.e. after 2 months on the sweet potatoes), or taken from the sweet potatoes and fed as porkers.

As additional proteins to supplement the sweet potatoes, skim milk was fed in various quantities and also concentrates (both full and half rations). Good growth curves were obtained in all cases and there is no doubt but that baconers can be made marketable very cheaply and very effectively by letting them graze on sweet potatoes and giving 3 to 4 pints of skim milk per day as well as a small quantity of concentrates as supplementary feed.

(13) Langebosch.

As mentioned in last year's report the coastal belt experienced the driest period in its history and it cannot as yet be assumed that the drought is over. In the coastal strip represented by Langebosch, the spring was favourable but conditions began to deteriorate from the beginning of December. It was only towards the end of March that good rains fell. Further inland, the whole summer was a dry one and although good rains fell towards the end of March and in April, the growing season was already past and consequently the veld was very short and seriously trampled. Moreover, the rains which did fall were very soft and consequently drinking water for stock is very scarce.

The winter was severe and cold and more and heavier frost was experienced than during last winter which was also a record season for severe frost.

Preparations were made for two unit experiments which should point the way in this area to a sound method of soil utilization. Both experiments deal mainly with milk production, both veld and arable land being used in one, and only arable land in the other. Wire was drawn and a milk shed built. One silo was completed and the building of dairies was commenced. A number of cows have been transferred from the Bathurst Experiment station, but more will be required.

A beginning was made with the cultivation of Carob trees. About three thousand were cultivated from seed sown in tins to facilitate transplanting, and a few hundred from cuttings obtained from growing trees. In the case of cuttings the sex of the trees is, of course, known, which is a great advantage.

(14) Upington.

Soil problems in this area still call for most attention. Experiments in connection with the improvement of brackish soils were commenced in collaboration with the Division of Chemical Services. The building of cement furrows for the accompanying irrigation experiments was also completed. Soil uniformity experiments on

soil dug up with a view to effecting better mixing of soil layers differing in mechanical composition, and allowing such sand layers as may be present to sink deeper into the subsoil, revealed that the soil can be made much more uniform and suitable for experimentation if dug up in the right way. Moreover, the reproductivity will also be enhanced. The wheat yield was 40 bags per morgen. No results have as yet been obtained on the experiment farm with potash, phosphate and nitrogenous fertilizers, but applications of farm manure or compost at the rate of 20 tons per morgen, have been found to give significantly higher yields.

Maize and soybeans cultivated on the same plots in a rotational cropping system with wheat for the past six years, with an annual application of only 15 tons of farm manure per morgen, are still producing the same yield as during the first year. Wheat on these plots maintains a yield of 30 bags per morgen. The soybeans have experienced no eelworm damage during the six years, whereas cowpeas in the same experiment were eliminated as early as the second year.

An experiment on the cutting of lucerne showed that if the first cutting is made at a fairly young stage, the yield for the season is lower than if the lucerne is cut for the first time at the 1/10th florescent stage. The yield with the latter treatment was 31 tons per morgen for the season as against 29.5 tons in the case of the former treatment.

Groundnuts produce high yields, "Natal Common" producing higher yields than "Virginia Bunch".

Among the varieties planted for seed propagation, Barberton, Guduyatham Bunch, Swaziland, Vigan Lupog, 43G 346 and 43G 68 were especially promising and are being tested out further.

Selection and breeding work with cowpeas, cotton, beans and especially lucerne was continued, the aim being better adaptation, higher yields, resistance to eelworm, early maturity and quality.

Colleges of Agriculture.

Grootfontein, Middelburg, C.P.

(Principal: G. J. Schuurman, H.D.A., F.T.I.)

Vegetables.

Although the rainfall during the year was below normal, livestock did well and with the aid of the good crops obtained, came through the drought comparatively easily. About fifty miles to the south an abnormal drought caused serious stock losses.

Farming Activities.—In spite of the fact that the rainfall of 11.4 inches was far below the average, 1,219 bags of oats, wheat and barley were harvested and 377 tons of silage made. In addition, 452 tons of lucerne hay were harvested, of which 328 came from drylands and 124 tons from irrigated lands. The existing established lucerne lands of 60 morgen were extended by 7.7 morgen and a further 13.5 morgen are at present being prepared.

At the Bloemfontein show the imported Percheron stallion "Histon Hallmark" won the championship and first prizes; the imported Percherons "Histon Dictator" (stallion) and "Histon Fair Rose II" (mare) were both awarded first prizes. At present there are 164 head of cattle at the Institution, including the Jersey stud herd. In addition, there are also 78 horses and mules, including 31

Percherons; 5,331 sheep, including 129 Karakul stud sheep; and 669 head of poultry. The prices of Karakul sheep showed a sharp decline and the income obtained from this source amounted to £1,232.

Surplus stock and products attained high prices. Income from sheep and wool was £2,977; from horses £130; from cattle and pigs £580; from farm products and sundries £1,200; from dairy products and poultry £1,788; from hostel fees £753 and from students' fees £2,374; amounting to a grand total of £9,802.

Agricultural Education.

During 1946 two special three-month courses in sheep and wool were held, but at the beginning of the year the courses were replaced by the Special One-year Course in Sheep and Wool. The latter course is the same as the second year of the Diploma course. Although there is a great demand for education in general agriculture, it was decided to register students only for the Two-year Diploma Course in 1948.

At the beginning of the year forty students were enrolled for the Diploma Course, twenty-one of last year's juniors were promoted to the Senior Diploma Course and fourteen were accepted for the Special One-Year Course in Sheep and Wool. To date, six students have abandoned their courses.

In addition to the above-mentioned regular long courses, a three-month course in sheep and wool was held for degree students who have assumed duty in the Division of Soil Conservation and Extension. A special one-week course in Jersey cattle, held at the request and with the assistance of the Jersey Stock Breeders' Association, was attended by forty breeders. For two days lectures and demonstrations on sheep and wool were held for fifty representatives of various wool auctioneering firms. These lectures and demonstrations aroused particular interest and gave rise to informative discussions. Lectures and demonstrations on sheep and wool were held during three days for approximately seventy-five farmers' associations.

In some divisions education was hampered by vacancies occurring in the posts of Lecturer in Horticulture, Lecturer in Engineering and two assistant posts in Poultry and Dairying. Lectures in horticulture and engineering are given by officers from other institutions. The destruction by fire of the wool shed was a severe loss, and practical tuition in sheep and wool is now being given under difficult circumstances. A modern building suitable for this branch of education is an urgent necessity.

The new hostel for students is in the process of erection and should be completed before the end of next year.

Extension Work.

Although this part of the activities of the College has been transferred to another Division, officers of the Institution held 66 lectures and demonstrations attended by approximately 1,131 farmers, visited 117 farms, judged at 7 agricultural shows, and attended 16 conferences and meetings. Altogether 6,494 letters were answered, of which 1,458 were of an advisory and the rest of an administrative and educational nature. A total of 16 articles were submitted for the Press Service and 6 for *Farming in South Africa*. The analysis of 927 soil and other samples was undertaken by chemists of the Institution.

Research.

Agronomy.—All experiments were revised during the past year and new experiments were planned. In the 17 experiments completed

during the year, attention was paid to various aspects of the cultivation and utilization of lucerne, winter cereals, potatoes, beans, grasses, etc.

The experiment on lucerne breeding yielded valuable inbred selections for hay, grazing and dryland purposes. These selections will now be crossed, the results tested and the best propagated in pure form.

Of the 27 wheat varieties tested, Lalkasarwali, McDonald, Turkey Red, Scheepers, Marina and Queen Fan yielded the best results. Langgewens was the best of the various types of oats.

In the potato experiment, the Irish Up-to-Date yielded better results than the other 25 types of European and American origin. The 12 inch spacing in the rows was significantly better than the 18 inch spacing.

There were no significant differences in the yields obtained from seed potatoes from the 9 seed potato growers' associations. Virus X-free seed from the Riet River, however, yielded better results than those obtained from seed potato growers' associations.

Entomology.—The only caterpillar infestation worth mentioning, viz. that of the Karroo caterpillar (*Loxostege frustralis*) occurred in the vicinity of Middelburg during October-November 1946.

Testing of imported types of parasites was continued in the laboratory. It appears that only two types of larva parasites (*Phytodietus pulcherrimus* and *Campoplex sulcatellus*) and the pupa parasite (*Cryptus* sp.) are worth using against the Karroo caterpillar. Since it is very difficult to breed large numbers of larvae of the Karroo caterpillar in the laboratory, it seems as if it will be more economical to import these types of parasites on a large scale.

Control of Cochineal with D.D.T.—Experimental results have proved that cochineal may be controlled by means of spraying with D.D.T. but owing to the high cost, it is doubtful whether the measure can be applied economically.

Other Insects.—During May-August 1947, the larvae of an unidentified type of moth caused great damage to Karroo bushes, especially of the *Pentzia* types, in the neighbourhood of Murraysburg.

Rock-Rabbit Problem.—A preliminary report on this problem was drawn up for publication.

Botany and Grazing Research.—In 1940 a long-term programme of investigation was undertaken.

A total of 14 different grazing treatments with both cattle and sheep, as well as complete rest, were applied to 77 small paddocks on 4 different types of veld with a total area of 303 morgen.

After approximately seven years, of which two were drought years, even paddocks which received the most favourable treatment showed poor recovery. During years with a favourable rainfall, such as the present one, certain treatments show a strong tendency to build up the soil which is broken down again during dry years to a level at which the varying effect of favourable and unfavourable treatments is practically invisible, whereas soil losses, especially due to wind action, take place at an alarming rate.

During favourable years, however, rotational grazing systems provide a considerable amount of grazing for cattle as well as for sheep which is not the case where veld is continuously grazed by sheep.

The animals used in the experiments are in good health. There are practically no differences worth mentioning, and those observed in the continuous grazing experiment are not as conspicuous as is sometimes the case.

Progress was made with the cultivation, budding and establishment of the honey-locust tree (*Gleditsia triacanthos*).

Chemistry.—(a) Work was done for the Locust Control Section on the elaboration of data and on experiments in connection with arsenic bait.

(b) The analysis of spineless cactus in connection with sheep feeding was undertaken and yielded information on variation in quality. The findings will be printed shortly.

(c) In an experiment for determining the effect of ammonium sulphate on the protein content and yield of winter cereals for grazing, it was found that the quantities used brought about no definite improvement.

(d) Experimental work on the use of fertilizer, manure and compost, as well as experiments on the reclamation and utilization of fallow lands, are continuing.

(e) In an experiment in which manure, compost and mineral fertilizers are compared, it was found that manure and the largest quantities of compost showed a satisfactory improvement only in the yields, the expected improvement in structure failing to materialize as yet.

Sheep and Wool.

Nutrition.—Comparisons were made between Merino stud and flock sheep, as regards growth, wool production and reproduction at three levels of nutrition.

When the sheep were weaned, the difference in weight in favour of the stud sheep was already 16 lb. of which more than 88 per cent. is ascribed to the nutrition factor. At the age of 18 months the wool production of flock sheep was 80 per cent. of that of stud sheep. The nutrition factor also strongly influences the sexual activities of young merino ewes.

A level of nutrition equal to 0.63 per cent. of the optimum, has an influence on the body weight of merino ewes between the ages of 4½ to 18 months, yielding 47 per cent. normality. Wool production was 46 per cent. of the normal production and important body measurements were reduced by 20 per cent. Further, only 12.5 to 25 per cent. of the ewes showed oestrus at an age of 10 to 15 months.

Ewes subjected to a low level of nutrition for long periods are unable to achieve normal growth, development, wool production and reproduction even if they receive optimum treatment for a prolonged period at a later stage.

Grazing Management.—The results of the past 12 months have confirmed those of previous years. Seasonal rotational grazing for four and six months yielded poor results; mortality during the severe drought was 60 per cent. A grazing programme of 1 sheep per morgen reveals the harmful effect of a heavy grazing intensity on the growth of the sheep as well as on wool production and mortality.

Sex Physiology.—The fertility of the following breeds of rams was studied: Southdown, Dorset Horn, Blackhead Persian, Merino and the half-bred, three-quarter bred, and F₂ of the Southdown × Persian and Dorset Horn × Persian.

After the rams had been tested in the laboratory for fertility for 24 months (sperm motility, pH concentration, etc.), they were mated to ewes in order to compare actual fertility with the sperm picture.

Type Development in Merino Sheep.—As previously reported, the experiment is being continued with 100 stud ewes in each group. The success obtained in the development of the two types is ascribed to the use of the method of scoring when judging, and to progeny tests.

There is no significant difference between the wool production of both rams and ewes of the two types at the age of 18 months. The average wool production over a period of 4 years was reasonably constant and the following are the averages of scoured bone-dry wool for all the years, calculated at 365 days per year.

	<i>Rams.</i>	<i>Ewes.</i>
(a) Plain-bodied type	7.6 lb.	7.0 lb.
(b) Ultra plain-bodied type	8.1 lb.	6.9 lb.

It must be emphasized that the two types have not yet been determined. The above-mentioned names of the types only serve to indicate the prescribed standard.

The sires of the above-mentioned young sheep yielded on an average 11.06 lb. (a), and 8.94 lb. (b) of scoured bone-dry wool.

Excessive fold development is eliminated in both studs. Folds on various parts of the body, i.e. collar, tail and crutch, are positively correlated. The stud rams yield only 14.5 per cent. more wool than the stud ewes. A block staple formation is apparently accompanied by a high proportion of cast lines and backs.

Merino Types Less Susceptible to Blowfly Strike.—Here too, the method of scoring was applied. Blowfly strike in the experiment flock was lower than in the control animals, but no wool was lost. Of the total number of blowfly strikes, 85 per cent. occurred in the crutch, the presence of folds next to the bare patch under the tail being the main cause. The results of the experiments indicate that blowfly strike can be considerably reduced if sheep are selected with a view to eliminating susceptible crutches.

Development of Mutton Breeds.—(a) Small pure-bred Southdown and Dorset Horn studs are kept for the provision of experiment material.

(b) *Southdown-Blackhead Persian.*—The technique of description and scoring is being successfully applied and a particularly successful strain is being evolved by means of breeding. A very hardy, but good mutton breed is being bred, but the limited breeding season of the F₁ type which is used as foundation stock, is a great disadvantage. Recently it was found that a small percentage of ewes do lamb in autumn, and this material is now being used for fixing this character.

(c) *Dorset Horn-Blackhead Persian.*—Description and scoring are being applied with great success. At the age of 5 to 6 months, young sheep reach a live weight of 65-70 lb. on natural veld.

(d) *Improved Blackhead Persian.*—There is little variation to be found in Blackhead Persians on which to base selection for less localized fat. An F₂ Dorset Horn-Persian was used for creating the variation. To date, the results are very satisfactory. Studies are also being made in connection with the skin value of the new type for comparison with the Blackhead Persian.

Cross Breeding with the Merino as Basis.—(a) *Dorset Horn-Merino.*—The hardiness of various degrees of this cross are being studied under veld conditions. The half-bred and grade sheep thrive on good Karroo veld, and the lambs mature rapidly if green grazing is available for the lambing ewes.

The wool of these sheep is inferior and of poor quality. The income from the $\frac{3}{4}$ bred type is approximately 7s. per sheep per year.

(b) *Merino Half-Bred Ewes for Fat-Lamb Production under Irrigation*.—The following half-bred ewes are being used in a study on a unit under irrigation: Border Leicester-Merino, Romney Marsh-Merino, Dorset Horn-Merino, Corriedale-Merino, German Merino-Merino.

The lambs attain a weight of 65 lb. at the age of 90 to 120 days on lucerne grazing in summer and wheat grazing in winter. The half-bred Border Leicester and Dorset Horn ewes yielded the highest percentage of lambs fit for slaughter, and those of the former type of ewe showed the best rate of growth. The best quality lamb carcass was obtained from the Dorset Horn-Border Leicester, and German Merino-Merino types. If judged according to Merino standards, the quality of the wool is poor. For ideal lamb carcasses a pure Southdown is the best mutton-breed ram to be used with the above-mentioned ewes. High-grade Southdown rams are good substitutes if no purebred ram is available.

Karakul Breeding: (a) Pure-bred Karakuls.—A small stud is kept for providing experiment material. Surplus rams and ewes are sold annually.

(b) *Karakul Grading Experiment with Blackhead Persian*.—Two types are used, viz. the shallow-curl and the close-curl type. The following are the results of the third-cross lambs (i.e. $\frac{3}{4}$ karakul): Rapid improvement was obtained by grading up with pure-bred Karakul rams on Blackhead Persian ewes; more than 75 per cent. of the skins of the third-cross lambs are marketable.

From the experiment results it appears that although the difference between the points or marks awarded for curl in the third cross, in favour of the curl type is significant, all other differences are insignificant.

Co-operative Experiments on Farms: (a) Mutton Breeds.—Very good results are being obtained in the Colesberg and Fraserburg districts where breed-development experiments are being carried out.

Merino-Type Development.—These studies were commenced on a few farms near the College.

The aim is to see whether a modification of the methods developed for experiment purposes can be used for ordinary stud-breeding purposes. The main object is to obtain uniformity and to apply progeny tests in the selection of rams.

Potchefstroom, Transvaal.

Principal: G. J. Bosman, B.Sc. (Agric.)

On the whole, climatic conditions for the period under review were somewhat more favourable than those of the previous year, although they still left much to be desired. The spring rains fell in October and although the total rainfall was not much below the average, as shown by the figures below, most of the precipitation occurred in light showers of less than half an inch, which was insufficient for the successful cultivation of summer crops in the western Transvaal. Another outstanding characteristic of the season was the extremely cold weather during July. On several nights the barometer registered 25 degrees of frost. The grazing however, remained palatable throughout the winter months and farm animals are, on the whole, in good condition.

The following table shows the rainfall figures for each month as compared with the average for this area.

Rainfall figures as compared with the average for the area.

Period.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1946-47	—	3.91	1.81	3.27	4.36	3.18	3.83	2.14	0.22	—	—	—	22.72
1908-46	0.76	1.88	3.17	3.94	4.15	3.85	3.27	1.30	0.72	0.30	0.33	0.41	24.08

Agricultural Education.

Diploma Course.—At the beginning of 1947 the College re-adopted the pre-war system in which both junior and senior diploma students attend the course. At present the course is being attended by 32 senior and 44 junior students. During the year 1 student failed in his final examination and 7 others left the Institution to farm. One student with previous training joined the senior course in February and one junior joined in July 1947. The demand for the course remains heavy and applications have been received for the reservation of accommodation up to 1951. With 45 as the maximum number of students which can be accepted every year, the College will be filled to capacity next year. Only 5 students are accepted from outside the boundaries of the Union every year. The senior students were taken on two educational tours, one to Viljoenskroon and the other to Vereeniging. Project work for the students was introduced for the first time in consequence of experience gained during the war. The results seemed to be satisfactory, especially in the case of senior students with the necessary basic knowledge in connection with the problems.

Short Courses.—These courses are very popular with farmers as well as city dwellers. Apart from courses for the public, a few were held on the execution of specialised services for civil servants. The particulars are as follows:—

Date of Commencement.	Course.	Days.	Number present.
25/11/46.....	Beekeeping.....	4	25
15/10/46.....	Groundnuts (Civil servants).....	4	12
20/ 1/47.....	Seed potatoes (Civil servants).....	6	36
28/ 1/47.....	Seed potatoes.....	4	120
14/ 4/47.....	Grain Grading.....	28	28
30/ 6/47.....	Animal Husbandry, Crop Production, Farm Management.....	19	51
30/ 6/47.....	Poultry.....	6	40
7/ 7/47.....	Weaving.....	6	11
14/ 7/47.....	Fitting of Clothes.....	6	16
	TOTAL.....	—	339

In the grain grading course 16 students received full certificates and 5 partial certificates.

Extension Work.

Although extension work is no longer included in the functions of the Colleges of Agriculture, the public is making increasing use of the facilities and services available at the Institution. Furthermore, the Institution with its various branches receives many visits from persons desirous of gaining special information. The poultry section, for instance, had 443 visitors. The number of letters for advice is still increasing.

Agricultural Production.

Crops.—The maize yield of the Institution was very low, viz., only 500 bags, representing not even 50 per cent. of a normal crop. This is due to a critical dry period during January and February.

The lucerne crop of 500 tons was good and, owing to the dry weather, it was also possible to make hay of a high quality. The policy of establishing about 14 morgen of lucerne annually to take the place of old lucerne which is ploughed out, is still being applied, and consequently the total area under lucerne remains about 70 morgen. The oats crop of 300 bags was normal. About 207 tons of maize, and maize and lucerne silage were made. There was considerable demand for the services of stud stallions at the College. The number of mares sent was so large that it was almost impossible for all to be served.

Animal Husbandry Research Work.

(a) *Digestibility Experiments.*—The nutritive value of South African fodder pasture crops is determined by means of a series of digestibility studies and during the past year digestibility experiments were carried out with the following feeds: lucerne hay, lucerne leaf meal, groundnut hay, stover, sweet-grass hay, sunflower heads, maize and cob meal, oat hay, kudzu vine hay, *Glycine javanica*-hay, camel-thorn pods, field-grass hay, *Panicum kabulabula*, *Panicum maximum* and *Acroceræ* hay.

In addition to the above a continuous digestibility experiment was also carried out in order to determine the nutritive value of Napier grass at different stages. Over a period of 7 weeks, 7 separate determinations were made.

(b) *Pig Experiments.*—A series of pig experiments was begun in order to determine to what extent roughage in its various forms can replace the concentrates in the ration of baconers. Part of this experimental work has already been completed, viz. where the concentrates consumption of pigs was limited and they received young green lucerne *ad lib*. The experiment went off successfully and the data are being elaborated.

A further experiment is now in progress in which the concentrates of pigs are also limited. So far, this experiment has progressed favourably.

(c) *Milk-Production Experiments.*—A beginning was made with a study of the influence of feeds in various forms on the quantitative and qualitative milk production of cows. The first part of this experimental work has been concluded and the data will be elaborated.

(d) *Grazing Experiments.*—The activities of the pasture research section can be divided under 5 headings, viz: (1) artificial pastures, (2) natural veld, (3) fodder trees, (4) co-operative experiments and (5) grass breeding.

(i) *Artificial pastures:* The results obtained under a system of summer grazing on perennial grasses established during the previous season, except for Rhodes and babala, which were established this year, are set out in the following table:—

	Napier fodder.	Small Buffalo grass.	Rhodes grass.	Conch grass.	Babala.
Cattle days per morgen.....	1,340	600	808	606	640
Total increase in weight of cattle	48 lb.	371 lb.	339 lb	475 lb.	180lb.

In the case of Napier fodder and babala the plants were already too far developed when grazing was commenced and this was responsible for the low weight increase of the cattle. That the carrying capacity of Napier fodder is high, is proved by the large number grazing days per morgen.

In collaboration with the Animal-Husbandry Section digestibility experiments are being carried out with hay made from *Panicum kabulabula*, *Panicum makarikari*, *Glycine javanica* and kudzu-vine, Napier fodder at different stages of development, and Honey-Locust pods, as well as silage made from Napier fodder.

- (ii) *Natural veld*.—A series of 12 grazing experiments on natural veld is under way for testing out various systems of veld control. A further 6 experiments will be commenced shortly.
- (iii) *Fodder Trees*.—About 4,000 Honey Locust (*Gleditsia triacanthos*), 1,000 Mesquite (*Prosopis juliflora*) and 150 Belhambra-trees were cultivated. Cleft grafting was also applied on a number of Honey-Locust trees with a poor pod yield.
- (iv) *Co-operative experiments*.—Co-operative experiments were commenced with two farmers and grasses were planted in vleis. It seems as if considerable success can be obtained with a mixture of *Phalaris tuberosa*, Italian rye grass, Chilean red clover and wild white clover. New Zealand tall fescue (*Festuca arundinacea*), Napier fodder and Nile Grass (*Acroceras Macrum*) also look promising.
- (v) *Grass Breeding*.—A series of millet-grass hybridizations was made from which a quantity of potential hybrid seed was obtained. This seed will be sown and studied during the coming season.

Setaria seed was collected locally and at different experiment stations in order to provide sufficient material for the execution of various breeding projects.

Poultry Research.—This institution was placed first at the central egg-laying competition in both the light and heavybreed sub-sections of the section in which Colleges of Agriculture compete.

As regards poultry research, it has already been mentioned that during the first six months of the report year, the food position was so poor that research work was out of the question. Consequently, this side of the work came to a complete standstill at first, but from April 1947, matters improved and the following experiments were undertaken.

- (i) *Angola fishmeal in laying rations*.—This experiment has been carried out before, but owing to the poor quality of fish oil so many hens went lame as a result of the lack of vitamin D that the experiment had to be stopped. The object of the experiment is to determine to what extent Angola fishmeal, the nutritive value of which is unknown, can be used in our laying mixtures. This experiment will only be concluded in January 1948, when it will be possible to come to some conclusion.
- (ii) *Angola fishmeal in chicken rations*.—This fishmeal was tested out for the same purpose in chick rations. The

- results were very satisfactory and the fishmeal seems to have no detrimental effect on the growth of chickens.
- (iii) *Maize and cob meal in laying rations.*—In this experiment the aim was to determine to what extent maize and cob meal can be fed in laying rations. It is alleged that good production can be obtained on this feed and that it prevents cannibalism and feather eating. This experiment will also be completed in January 1948, when it will be possible to make the necessary conclusions.
- (iv) *Green dried wheatmeal and green dried oatmeal in chick rations.*—These two products are being tested out in chick rations in order to determine to what extent they provide vitamin A, flavin, pantothenic acid, etc., to chicks as compared with lucerne meal. The two products were cut at a very early stage. In this form, the nutritive value is said to be very high. This experiment is still in progress and no conclusions can be made as yet.
- (v) *Encephalomalacia in Chicks.*—This disease in chicks has caused considerable difficulty in experiments during the past few years. The chick become dizzy and dies shortly after the appearance of the symptoms. This disease (also known as dronksiekte) is becoming a very frequent occurrence on poultry farms. An experiment was carried out in order to determine to what extent D3 and D2 are responsible for this condition. A ration was used which on a previous occasion yielded as many as 75 per cent. of cases. In this experiment only 3 cases occurred and no conclusions could be made.
- (vi) *Importation of Duck and Turkey Eggs.*—Duck and Turkey eggs were imported by air from America. This was a pioneer enterprise of the Department in this field. Under the circumstances the results were so satisfactory that in future this means will probably be employed for a large percentage of poultry imports. In this way it will be possible to prevent many of the poultry diseases which may be imported.

Field-Husbandry Research Work.

This includes plant breeding, field-husbandry fertilizer experiments and the work of the seed-testing station.

- (a) *Plant breeding.*—Good progress has been made with the investigation of the breeding of hybrid maize seed. The programme was more than doubled during the past year and this investigation will be further expanded during the coming year. These institutions will require additional facilities to launch the hybrid maize seed project, in collaboration with the Maize Industry Control Board, among producers as soon as possible. It cannot be expected, however, that the final product, viz. double hybrid seed, will be available to producers in any worthwhile quantity before 1949. The programme also includes the testing of existing single and double hybrid breeds in the various production areas in order to determine accurately their adaptability and production in these areas. The work in connection with sweetcorn syntheses has progressed to such an extent that increased quantities of

seed will be available for planting during the coming season for experimental canning purposes.

The wheat-breeding project has reached the stage where new combinations between parents with a high yielding capacity and resistance to disease, previously developed, are about to be tested. Another series of combinations which has also reached the testing stage is that derived from *Agropyron* hybridizations. This group is more promising as a source of selection for disease resistance than most of the wide hybridizations between wheat varieties which have so far received attention here. This work is aimed mainly at producing blight-resistant wheat varieties for the summer rainfall areas as well as varieties more suitable for grazing purposes.

The breeding programme was also expanded in respect of other winter cereals, especially new oat varieties, from the Stellenbosch-Elsenburg College of Agriculture.

The breeding programme with soybeans, cowpeas and other bean types, including groundnuts as well as with kaffircorn is proceeding.

- (b) *Fertilizer experiments*.—All the fertilizer experiments on the local experiment plots as well as one co-operative compost fertilizer experiment were continued. As a result of the extremely difficult year, (poor and irregular rainfall), the yields are considerably lower than during the previous year, and to some extent results also clash with those of previous years.

It was clear throughout that the fertilized plots were more severely affected than the unfertilized plots, with the result that in many cases the unfertilized treatments gave higher yields than the fertilized ones.

- (c) *Potato experiments*.—The source experiment with certified seed from seed growers' associations was again carried out. Unfortunately, not all associations took part. Useful data were, however, obtained.

The institution is engaged in developing its potato breeding programme, especially with material obtained from the Empire Potato Collection, in collaboration with the Division of Botany and Plant Pathology and the Riet River Experiment station.

- (d) *Seed Testing Station*.—The activities of the Seed Testing Station were carried out according to the available space, supervision and staff. So far the following numbers of samples were submitted for (a) purity, (b) germination tests, and (c) general investigation.

1942-43.....	301
1943-44.....	647
1944-45.....	946
1945-46.....	2,034
1946-47.....	2,370

The application of the regulations (under the Act in connection with seeds, weeds, etc.) on teff, lucerne and other seeds, showed that guidance is still needed by persons who have to comply with these regulations. No prosecutions were instituted in connection with inadequately marked or infected seed, since where such difficulties were experienced, the sellers immediately reacted favourably to warnings and suggestions.

A very remarkable development is the increasing voluntary use made by the seed-trade and seed producers of the services of the Seed Testing Station. Considerable quantities of seed were tested under the Vegetable and Maize certifying Schemes—the former in collaboration with the Division of Horticulture.

The difficulty experienced with the germination of stock-rose seed showed the necessity for prescribing the best germination methods for seed issued on a large scale (under Government control).

The poor germination of groundnuts in two places in Natal was also investigated. It was found that, as in the case of extensive poor germination in the Pietersburg district during 1943, the cause could be sought in the inadequate treatment of slightly or badly damaged seed.

Methods for the sizing and grading of maize seed and the planting of non-flat seed are being investigated with the object of effecting better utilization of certified and other expensive seed.

Glen, O.F.S.

(Principal: I. P. J. du Plessis, M.Sc.)

Following on the good autumn rains of 1946, which resulted in a good wheat crop in the Orange Free State, an exceptionally dry summer was experienced throughout the Union in 1946-47. At Glen the 6 summer months (1 October 1946 to 31 March 1947) represented the driest summer in the three decades of the Institution's existence. The rainfall was 1.20 inches lower than for the same period of the very dry summer of 1932-33. The natural grazing was scarce but nutritious. The Modder River, however, always had sufficient water to provide adequate irrigation for the lucerne lands at Glen.

The nutritious pastures of the western Orange Free State and the northern Cape Province could make very little growth during the summer drought. Consequently, large numbers of stock either had to be transferred from the western parts or sold. In the cropping area of the eastern and northern Orange Free State the summer rains were not so poor and fair summer crops (especially maize) were harvested. The winter crops of 1947 (especially wheat), are also promising in the eastern Orange Free State. The increasing demand for groundnuts created a market for this product of which the Free State farmers made full use. For the first time the north-western Orange Free State yielded a large groundnut crop.

In October 1946 the soil-erosion staff and the home economics officers of the Glen College of Agriculture were transferred to the regional office at Bloemfontein. Until the end of December 1946 however, the usual advisory correspondence was still undertaken at Glen. From this date the regional office has been responsible for all extension work in the Orange Free State and northern Cape Province.

Staff.—With the re-organisation of the agricultural education and extension functions, the total salaried staff establishment of the College of Agriculture fell from 60 to 50. On 30 August, 1947, only 36 of these 50 posts were filled. The aftermath of the war is therefore still causing a serious shortage of personnel at the College and consequently both the educational and the research services of the institution are seriously hampered.

Agricultural Education.

Farming is pre-eminently a practical vocation. The student of agriculture learns more through his eye than through his ear.

Practical agricultural instruction cannot, therefore, be given with the aid of a microphone to a large number of students at the same time. Only a small number of students can, for instance, benefit simultaneously from a demonstration on judging with a certain type of farm animal.

The number of students admitted for the various courses at Glen this year are in every case the maximum numbers which could be coped with by the available staff and other facilities. Several courses for which there was a demand could not be held and in the case of practically all the courses held, the number of applicants far exceeded that which could be accepted. Briefly, it may be said that the demand for agricultural education was double the number of students which were accepted for courses, as shown below. The attendance of courses was as follows:—

Senior Diploma (1947).....	23
Junior Diploma (1947).....	23
Three months' Sheep and Wool Course (4/2/47-7/5/47).....	16
Judging of Afrikaner cattle (16 to 20/9/46).....	25
Horse-breeding (30/9/46 to 4/10/46).....	26
Poultry—for extension officers (27 to 31/1/47).....	44
Poultry Farming (7 to 18/7/47).....	19
Grain-grading (24/6/47 to 18/7/47).....	31
TOTAL	216

For all the above courses, the services of officers and other professional persons from outside the institution had to be enlisted for certain parts of the instruction. In this connection the help and co-operation of the Afrikaner Cattle Breeders' Association, the Horse and Mule Breeders' Association of South Africa, the Wheat Control Board and the Central Western Co-operative Association are specially appreciated. For the regular two-year diploma course and the three months' sheep and wool course the maximum numbers were accepted according to the accommodation and other facilities. It must be mentioned with regret that a large number of suitable applicants unfortunately had to be refused admittance. The type of student accepted for the courses and especially for the diploma and sheep and wool course was of a very high standard. For the diploma course only matriculants could be considered. Where students with good educational qualifications also take a special interest in their instruction, the teaching staff finds it gratifying and good progress is usually made with such educational work.

The project system (in which students are charged with interesting tasks and observations) is yielding good results.

Bursaries.—For the year 1946 four departmental study bursaries of £15 each and one O.F.S. bursary of £20 were awarded to diploma students. For 1947 ten departmental study bursaries of £15 each and one of £20 were awarded to diploma students. Only four Free State students applied for O.F.S. bursaries of £20 each for 1947.

Certificates.—Since the diploma course was only resumed in 1946, the first new diplomas cannot be awarded before December, 1947. 23 first-year candidates from 1946 have been admitted for their final year in 1947. In May 1947, 15 certificates were awarded to successful candidates in the three months' sheep and wool course. In July 1947, 27 grain-grading certificates were awarded of which four were only partial certificates.

Extension Work.

The assistance still rendered by the College this year to the regional office of the Division of Soil Conservation and Extension,

is reflected in the following figures in respect of extension work carried out by College officials, viz.: 2,490 letters of advice to farmers; 13 lectures on farmers' days at which 800 persons were addressed; 7 wool courses held; judging carried out at 5 shows; inspection and classing of 300 head of cattle, 2,940 sheep and 280 head of poultry. In addition, a considerable number of plants and plant diseases were identified for farmers, soil and fertilizer samples analysed and articles for *Farming in South Africa* and radio talks compiled. More than 600 farmers and other members of the public visited the College on their own initiative in order to obtain information.

The Boschetto College of Agriculture at Harrismith was assisted with the examinations in animal husbandry, poultry, field husbandry, horticulture and chemistry.

Officials of the College also assisted with seed-potato inspection at various seed-growers' associations in the O.F.S.

The *Central Egg-laying Competition* is still held at Glen. The Twenty-first Open Competition and the Thirteenth Breeders' Register Test were concluded on 3 March 1947; 870 hens were entered for this competition and the production performances were satisfactory.

For the Twenty-second Open Competition and the Fourteenth Breeders' Register Test commenced on 1st April 1947 the full quota of 900 hens was accepted, all the property of members of the Breeders' Register.

Research Work.

No professional officer was available for full-time research work during the year. In various directions, however, progress was made with research and experiments.

Pastures.—The veld-control experiments on red-grass veld are being continued. The botanist is also working on veld-restoration experiments and the propagation of seed of promising indigenous fodder crops, which will later be tested out co-operatively on farms.

Good progress was made with the experimental cultivation of *fodder trees*, such as *Gleditsia*, *Prosopis* (Mesquite), etc., as well as with the application of methods of seed germination, planting out, etc. About 8,000 trees of various species have already been cultivated and some have been issued to farmers.

Dairy Cattle.—From experiments with Friesland cows it was evident that maize silage was a better succulent feed than spineless cactus—fed in equal quantities. Interesting differences were also found in the butterfat percentages at different milking times. The same cow which yields 2½ per cent. butterfat in her morning milk yields 5 per cent. in the afternoon and almost 4½ per cent. in the evening. This knowledge is of great practical value to dairy farmers. This experiment is being continued.

Silage.—For farmers farming on the drier side of the cropping area (e.g. Glen), it is of importance to know that certain *sugar-cane varieties* yielded good silage crops this year with only 5 inches of rain during the growing period. "Wintersome", "Machavie" and "Eschowe" yielded more than seven tons of silage per morgen on the dryland experiment plots at Glen.

Potatoes.—Of the 22 new imported potato varieties planted under irrigation, "King George" and "Ulster Crombeck" (of Scottish and Irish origin) and "Katalidin" and "Bliss Triumph" (of Canadian origin) yielded the best results.

A fertilizer experiment with potatoes carried out on the farm "Versien" in the Bethlehem district, showed that phosphatic

fertilizer not only yields a better crop, but also counteracts "leaf roll", whereas potash fertilizer aggravated the leaf roll and produced no increase in the yield.

Poultry.—The records of the poultry section showed that hens with an exceptionally high production of, say, 270 eggs or more during their first year tend to have a lower production during their second year than hens showing only a good average production (say 180 to 200) during their first year.

A comprehensive study of the figures available on the central egg-laying competition is at present under way. The careful records of many years are being examined in order to determine the relations between production and other recorded characters or practices, such as egg size, broodiness, moulting, loss of weight, date of hatching, etc.

Wool-fibre Study.—The activities of the sheep and wool section include a study of the *fibre content* of ordinary textile wares, and especially those known in the trade as "woollen goods". It appears that materials sometimes offered for sale labelled as "all wool" do not contain a single wool fibre. In other cases again genuine wool articles are sold under the name of "pure cotton". The study is being continued.

Rainfall Run-off.—The investigation into the *run-off of rainfall* is now completing its tenth year and will probably be ready for summarising for publication shortly.

Dairying perhaps offers the most profitable field for research at Glen, since the largest cheese factory and the largest butter factory of the Union are both situated in the Glen service area. The necessity for adequate staff and other facilities for this purpose has already been mentioned in the previous report.

General.

Maintenance Costs.—Since agricultural education and research are both regarded as expensive functions of the State, it may be well to mention that for the greater part, the ordinary annual maintenance expenses of the Institution (including all farm and College labour, equipment, supplies, fuels, etc.—even for the research work, egg-laying competition, etc.) are covered by the cash income which this year amounted to £7,500 apart from the "free issues" of stud stock and farm products.

Staff and Student Organization.—Since it is realised that the future farmers educated at Glen should also have the necessary educational facilities to qualify them as useful citizens of the State, provision is made at Glen for the staff and student organizations so indispensable to the work of such an Institution.

Cedara, Natal.

(Principal: H. H. Cornell, B.A.)

There were several changes in the personnel during the year, due to retirements and transfers. A change worthy of mention, is the retirement on pension on 20 August of the principal, Dr. John Fisher, after an almost uninterrupted period of service at Cedara of 38 years, for 30 years of which he acted as principal. It is appropriate to refer in this report to Dr. Fisher's efforts towards the advancement of agricultural education and farming in general in the area served by the College. His name will always be closely

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associated with the progress made in the field of pasture research and established grazing as a basis for dairy farming. Mr. H. H. Cornell succeeded Dr. Fisher and assumed duty on 1 September 1947.

Mr. R. J. Matthew, the farm Manager, also retired on pension after 18 years' service at Cedara.

Agricultural Education.

Short Courses.—During 1946 a series of 4 short courses were held on general farming, each lasting for 2 months. The courses were well attended and the students were completely satisfied with the knowledge and experience gained during their stay at the College:—

Date of commencement.	Duration.	MILITARY.		CIVILIANS.		
		Men.	Women.	Men.	Women.	Total.
6/8/46.....	8 weeks	26	3	2	1	32
7/10/46.....	8 weeks	19	3	5	1	28

Diploma course.—This course, which had been discontinued during the war years was resumed in 1946.

	Senior.	Junior.
Attendance number at Commencement in January, 1947.....	25	36
Attendance number at Commencement in August, 1947.....	24	33
Attendance number at Commencement in January, 1946.....	13	31
Attendance number at Commencement in August, 1946.....	9	30

	Senior.	Junior.
<i>Examination results:—</i>		
Passes: First class with honours.....	2	0
Passes: First class.....	2	0
Passes.....	5	24
Passes after supplementary examination.....	0	3
Number of students who left after 31 August, 1946.....	—	3

With the exception of three of the 1947 juniors, all diploma students were ex-soldiers.

Enrolments.—All vacancies for students during 1948 are filled, and there is a long waiting list in case of possible cancellations for 1948 and for 1949.

Farmers' Day.—A farmers' day was held on 25 April 1947 and was attended by approximately 400 farmers and other visitors. The proceedings were opened by Mr. R. A. Banks, Director of Agricultural Education in Natal.

Research.

Entomology.—The annual survey of wattle bagworm infections for the wattle areas of Natal, the Transvaal and the Transkei was made and maps drawn up. The infected area is the largest ever recorded, covering 100,000 acres.

Cryolite dusting from aeroplanes was carried out on 1,000 acres in the Harding area and on 250 acres near Pietermaritzburg. The results were good and the trees so treated were safeguarded against

infection, but, due to the drought, wind and broken country which made dusting ineffective, general spreading of the infection could not be avoided.

Ecological studies of *Achaea lienardi* (wattle looper), wattle-jassids and capsids (frog hopper) were continued as well as work in connection with the false codling moth and the citrus moth.

Entomologists collaborated on excursions to the 'Mkuzi Game Reserve to investigate the effect of the application of D.D.T. (from aeroplanes) on the insect population.

Biology and Pastures.—Existing experiments on the burning and cutting of veld were extended. Detailed records were kept of the growth and of tolerance of frost of all grasses grown on the grass plots.

Chemistry.—The fertilizer trials carried out during the year in connection with the use of Karroo manure, superphosphates—serpentine mixture and Kalfos did not furnish any useful experimental data. These experiments served their purpose however, and will not be continued.

Dairying.—Work in connection with the dairy herd included the following:— 932 butterfat tests, 628 solids-not-fat tests, and 38 Methylene blue tests.

Extension Services.

Extension services rendered by officers of the College fell considerably short of that of the previous years, due to the fact that this branch of the work which was previously performed by the College is now being done by the Division of Soil Conservation and Extension. Specialised extension work is still done by College Officers. The following is a summary of such work: Lectures, 18 (attended by 1,050 farmers); official visits to farms, 450; adjudicating at shows, 10; congresses attended, 12; committee meetings attended, 10; days absent on extension work, 160; articles for *Farming in South Africa*, 1; Press Service Contributions, 5; other articles, 2; Radio talks, 6; letters of advice to farmers, 3,800.

Due to the fact that there is no poultry officer at the Regional office of the Division of Soil Conservation and Extension, all extension work with regard to poultry in this area had to be performed by the Poultry lecturer of this Institution. This work includes all records of production and visits to farms (which took 27 days) as well as attendance to 781 requests for information.

A total of 472 samples were analysed and examined by the Chemistry section, mainly in connection with farming problems.

Cultures for inoculation of soybeans and clover seed were prepared and 920 bottles issued to farmers or used on the college farm itself.

During his six months of duty here, the botanist identified 30 plants and diagnosed 24 plant diseases.

Seed Potatoes.—Although this section falls under the Division of Soil Conservation and Extension, Mr. Schultz was approached several times for aid and advice. He was also responsible for the arrangements and inspection of the shipment of potatoes to Uruguay, and for the inspection of the potatoes.

General.

On the whole, the season was a good one. The total rainfall for the year ending 30 June was 40.6 inches which is considerably higher than the average annual rainfall of 35 inches according to data of the past 40 years. The rainfall was well distributed, it

started in October and continued till the end of April. A violent hailstorm, accompanied by 4 inches of rain, came down on 2 and 3 June, but no serious damage was caused. Heavy frosts occurred early in July; snow fell at the College and the mountains extending to the west were snow-covered. The cold weather was too late to have any noteworthy effect on the crops.

The good climatic conditions resulted in a very successful season on the farm. The crops were good and production was above normal. Fifteen hundred bags of mealies were harvested (the highest figure recorded in years), and 150 tons of soybean hay was made (which provides valuable protein-rich feed). High standard root crops were grown. The 100 acres of rye grass showed excellent growth and furnished valuable protein-rich winter feed. In spite of the fertilizer shortage, the *Paspalum* pastures were satisfactory, but the *Kikuyu* pastures suffered a great deal from the shortage of nitrogen. The winter pastures were exceptionally good and of great value as winter feed.

Both silos were filled with *Paspalum* silage and approximately 100 tons of *Paspalum* hay was made. The general condition of the veld during spring was good although it gradually declined as the season progressed. Approximately 50 tons of good veld hay was cut. Groundnuts were tested out on four acres. The crop was fairly successful but since early harvesting it was necessary to prevent sprouting, the quality and production suffered considerably as a result of immature seed. Further experiments will be conducted during the coming season.

Livestock.—An Ayrshire bull was purchased for the College and the Large White pigs were transferred from the Agricultural Experiment Station, Pretoria.

There is still a shortage of supplementary protein feeds such as oil-cake and bonemeal, and this has considerably hampered production as well as development.

Penicillin is used for the treatment of mastitis in the herd but no definite conclusion can be drawn at this stage. So far, results were satisfactory.

Investigation of Plant Diseases and Botanical Surveys :—

[Continued from page 1085.]

Articles, accounts or lists, etc. published, or in the course of preparation for publication, include an article on the fibre-producing species of *Hibiscus*, a write-up of twenty-four coloured plates for "Flowering Plants of Africa", a revised account of the Central and East African Expedition (with a list of about 2,000 plant names), and a check-list of the flora of the Weenen area.

Workers outside the Union have been assisted with identifications of collections of plants made in connection with tsetse fly and other research work. Over 2,000 duplicates were distributed to collaborators.

During the year specimens were sent on loan to the Bolus Herbarium, Pretoria University, University of the Witwatersrand and the Royal Botanical Gardens at Kew.

Low-Temperature Research.

**Rees Davies, Superintendent, Low Temperature Research
Laboratory, Cape Town.**

The policy in respect to the functions and scope of the work of this Laboratory is now under review. Pending a clarification of the position the question of restaffing of the Laboratory even to its pre-war strength has to remain in abeyance, and so have the schemes of expansion of facilities and staff. Consequently the work of the Laboratory is at present confined to what can most usefully be covered by a depleted staff and the position is being kept in as fluid a state as possible.

Investigations in Progress.

Dehydrated and Canned Vegetables.

Stored dehydrated and canned vegetables prepared two and three years ago are still under observation. Periodical assessments of quality and nutritive value are made on samples stored at various temperatures between 32°F. and 98°F. It is of interest to determine the extreme limits of storability of these products under a wide range of storage conditions. The storage samples will be exhausted in a few months' time and this will bring the programme of work on dehydrated vegetables to a close for the time being. The results of these investigations will be published during the course of the year.

Cold Storage of Vegetables.

A commencement has been made on a programme of investigation of the storage of a wide range of vegetables at temperatures within the range 32°-60°F. The vegetables receiving most attention so far are Little Gem squashes, tomatoes and potatoes. All these vegetables are subject to cold injury during storage at low temperatures. A very interesting phenomenon has been observed in Little Gem squashes during storage; the tissues between the vascular bundles collapse and fracture as the result of cold injury, and since the vascular bundles lie parallel to the skin removal of the latter reveals the vascular bundles as isolated strings closely resembling a ball of knitting wool. The rate of development of cold injury in the Little Gem squash seems to be highly correlated with the moisture losses during storage, this interesting observation will necessitate a re-examination of the effect of moisture loss during storage on the development of cold injury in such fruits as peaches, plums, etc.

In the storage of potatoes the loss of vitamin C at various storage temperatures indicates a consistent but complicated relationship with temperature. Up to a period of 12 weeks the least loss of ascorbic acid occurs in potatoes stored at 31°F.; the greatest

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loss at 34°, 37° and 40° whilst at 50° and 60°F. the losses are intermediate. The observation that diced potato tissue stored in a saturated atmosphere at ordinary laboratory temperatures shows large increases in ascorbic acid content, has been confirmed in this laboratory. It was further observed that the samples showing the greatest loss of ascorbic acid during storage showed the greatest regeneration when diced. The whole question of regeneration of ascorbic acid in diced potatoes is receiving further study.

The storage trials on vegetables this coming season will be supplemented by freezing trials as far as the limited facilities will permit.

Nutritive Value of Fruits and Vegetables.

The survey in progress has made considerable advances during the year and it is considered that sufficient data of a representative character have been collected for all the most important vegetables marketed locally. The results of the survey on vegetables will be published in the near future. With the completion of the main survey work on vegetables, greater attention can now be given to the wide variety of fruits marketed locally.

Arrangements have been made with an official of a firm in London, for the exchange of seeds of some of the most common cabbage varieties grown near Cape Town and London and for the determination of the ascorbic acid content of cabbages grown from the same seed samples under the two environmental conditions. It is anticipated that the investigation will throw some light on the proportional effects of environment and hereditary factors on the ascorbic acid content of cabbage. This investigation arises from the observation that the general level of ascorbic acid in cabbage grown in the Cape Town region is only half that of cabbages grown in the London area.

Citrus Wastage.

Large-scale experimental trials of the effectiveness of diphenyl-impregnated wrappers in controlling wastage of oranges stored under a wide range of conditions have indicated the desirability of more exact knowledge of the quantities of diphenyl that are absorbed by the fruit under different conditions and periods of storage. Methods of estimating the small amounts of diphenyl absorbed by the orange have been investigated. The most promising method proved to be the spectrophotometric method, but considerable difficulties were encountered and had to be overcome. Elimination of the orange oil from the spectrochemically pure cyclohexane used as solvent could not be effected by sulphuric acid owing to the reaction between diphenyl and the sulphuric acid. The orange oil present can, however, be determined by the spectrophotometric method and a correction applied to the absorption values obtained for the diphenyl. The method is accurate to within 5 per cent. In work on the standardization of the method some interesting observations were made on the absorption characteristics of orange oil of varying age, but further work is needed on this problem.

The availability of a method for determining minute amounts of diphenyl will now allow of a critical examination of the absorption of diphenyl by oranges and an attempt will be made to correlate this with wastage control.

Dehydration and Storage of Fish.

The quality of dehydrated stockfish is so promising that it offers considerable possibilities for supplying outlying districts which seldom, if ever, obtain fish supplies other than the canned product. The general experience of manufacturers with dehydration plants is such that there is little likelihood of any one taking up the dehydration of fish on a commercial scale without some knowledge of the reception that the product is likely to meet on the market. To overcome this difficulty the Laboratory undertook the production of approximately half a ton of dehydrated stockfish for this purpose. The product will be marketed through commercial channels in the rural towns throughout the country.

An investigation into the freezing of filleted stockfish has been started in conjunction with a trawling company. A very attractive 2-lb. pack of fillets has been evolved and storage tests are under way. A very light salting prior to filleting has been found beneficial, resulting in little or no drainage of juice on thawing.

During investigations into the cause of mealiness of the cooked flesh of the John Dory fish and the production of "milky" spots in smoked filets of stockfish, the presence of a histozoic protozoa was discovered. The discovery that the infested muscle fibres fluoresce under ultra-violet light which has been filtered through Woods' glass provided a rapid and accurate method of surveying large batches of fish for the presence of the disease and the degree of infection.

A systematic survey has been carried out on stockfish and John Dory, and approximately 60-75 per cent. of the fish was found to be infected.

The presence of the disease does not appear to have any effect on the edible quality of the stockfish, and there are no visible symptoms of its presence. During the smoking of the stockfish filets, however, the infected muscle fibres became visible as whitish "milky" spots resulting in anything up to 30 per cent. of the filets being discarded.

In the John Dory the severely infected fish are emaciated and flabby, with the flesh so soft that it cannot be filleted. Approximately half the filets from apparently firm fish become extremely mealy on cooking and consumers have found this so objectionable that the fish can no longer be sold. It is possible to sort out the non-infected filets by the use of ultra-violet light and such filets are of exceptional quality.

The intensity of infection is far higher in the John Dory than in the stockfish. There is reason to suppose that this may be due to secondary infections taking place in the John Dory, whilst only primary infections appear to be present in the stockfish.

The disease is also very prevalent in snoek, giving rise to the characteristic mealiness of the flesh on cooking. It is the presence of this disease that has prevented the utilization of the snoek as a high-class fresh or frozen product and forced the trade to salt and dry the bulk of the catch. The sorting out of the non-infected from the infected fish is quite possible by the use of the ultra-violet light and there is little doubt but that the non-infected fish would prove very suitable for the fresh-fish market and for freezing.

Farming Problems in the Winter-Rainfall Area.

J. S. Marais, B.A., Ph.D., Principal of the Stellenbosch-Elsenburg College of Agriculture, University of Stellenbosch.

ALTHOUGH good headway was made during the past year with the recovery programme for wiping out all traces of the neglect which was inevitable during the war years, there are still many defects to be eliminated. Equipment, building material, farm machinery and implements, fencing material and fertilizers are still scarce and the costs prohibitive; consequently, the shortage could not be supplemented and the equipment repaired to the extent which would have been desirable. The repair of broken-down fences and the erection of new ones is also progressing rather slowly, and the position as regards implements and machinery is still most unsatisfactory.

Farming Matters.

Generally speaking, farming activities progressed favourably, although the very dry spring and summer of 1946-47 were responsible for a wine crop far below normal and for very poor vegetable crops. The 1946 cereal crop was also poor, partly on account of the spring drought but also because of the incidence of root-rot diseases. The latter, however, were not as serious as during the previous year. Lumpy-skin disease caused a severe setback to the dairy industry and, although the disease has apparently subsided, it has left clearly visible traces behind. Milk production at Elsenburg is at present far below normal, since stud bulls have become sterile for a time.

In consequence of this, many cows and heifers calve 6 to 9 months later than would have been the case under normal conditions. The winter of 1947 was very favourable, however, especially as regards the distribution of rain and the nature of the temperature, with the result that the cereal crop is particularly promising. Unless damage is caused during the next six weeks by diseases and lack of rain, very good cereal crops may be expected. The north-western districts are still very dry, but in general the prospects for crops in the winter-rainfall area are very bright.

In so far as animal and poultry husbandry is concerned, the problem of feed is still acute and the shortage of nutrients such as bran, pollard and protein-rich concentrates considerably retarded production.

Owing to the very general use of tractors and lorries there was a sharp decline in the prices of horses and mules. The shortage of labour and feeds is forcing farmers to apply mechanization, and it is only the shortage of machinery which is holding up further mechanization. This phenomenon presages infinite difficulties for farmers, going in for extensive vegetable and wine production, who have always relied on manure. The supplies of Karroo manure are becoming exhausted and the supplies of other fertilizers offered for sale have also diminished. The only way out for wine and vegetable farmers is to keep dairy cattle and pigs and manufacture compost from the waste products of the animals. This procedure creates numerous thorny problems; co-operative bull societies or stations for artificial insemination will have to be established since farmers with a small number of cattle will not be in a position to keep bulls economically.

Education.

The Diploma Course is again in full swing, and there are as many students as can possibly be accommodated. The lack of sufficient accommodation will also limit the number of admissions in 1948. At present there are 32 second-year and 28 first-year students attending the course. Unfortunately there are always a number of students who abandon the course during the year. These are either students from cities who find farming less attractive than they thought, or students whose parents experience a serious shortage of labour on their farms and are compelled to withdraw their sons. Altogether 16 students abandoned their courses during the year.

Short Courses.—The attendance at short courses was very satisfactory. Here, too, the shortage of accommodation was a limiting factor in the attendance. Such short courses can only be held during vacations of the diploma and university students—the only time when accommodation is available at Elsenburg and Stellenbosch.

University courses in Agriculture are particularly well attended. In 1947 there were 263 degree-students of whom 104 were in the first year, 68 in the second, 47 in the third and 36 in the fourth year. There were 8 post-graduate students. There are 33 students attending forestry and 89 attending domestic science courses.

During the past year the following university degrees and diplomas were awarded:—

Agriculture:

D.Sc. (Agriculture)	2
M.Sc. (Agriculture)	4
B.Sc. (Agriculture)	19

Forestry:

B.Sc. (Forestry)	4
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Domestic Science:

B.Sc. or B.Ed. (Domestic Science)	5
Diploma in Domestic Science	21

Extension Work.

Extension work is being carried out on a large scale by way of short courses, farmers' days, correspondence and visits to farms and by visits of farmers to the Institution. It appears that the introduction of a regional office of the Division of Soil Conservation and Extension has not reduced the extension work of the Institution. On the contrary, it seems as if the work carried out by the extension officers is acting as an incentive to increasing numbers of farmers to make requests for lectures and demonstrations on farming, and as if it has the effect of increasing the demand for information.

The most important result of the activities of the regional offices is the stimulation of interest in the research work which is being done, but as yet there are no signs that the task of the Agricultural College has been eased.

There is also a further increase in the number of persons desiring information with regard to the purchase of land. An alarming feature, however, is that farms are still being purchased at such exorbitant prices. The prices paid for small farms in particular, are mostly totally uneconomic even with the prevailing high prices of agricultural products.

Research.

The tremendous increase in lecturing duties, the large amount of extension work which must necessarily be done and the shortage of personnel has an exceedingly adverse effect on the research work which has to be carried out. The education of students dare, however, not be curtailed in any way, and lectures, practical classes and demonstrations must necessarily take place at the fixed hours. Nor can applications for information from farmers be pushed to one side.

Agronomy.

From the crop-rotation trials, it becomes increasingly clear every year that the best rotations are those in which lucerne is included as a pasture crop. The residual effect of lucerne is still perceptible in the third cereal crop after the lucerne has been ploughed in. It is clear, however, that especially in the drier parts of the Swartland, other legumes are also necessary. Lucerne is difficult to establish here and the costs entailed are high. For suitable legumes to be obtained, work in connection with the choice of plants and especially breeding work is necessary. What are required are hardy, drought-resistant pasture crops which may be cultivated in rotation with cereals in the drier parts of the grain region. In parts with a higher rainfall, lucerne is the indicated crop, increases of from 50 to 200 per cent. having been obtained in the wheat crops.

Other legumes which have yielded promising results are subterranean clover, serradella and lupins.

The great value of manure (rotted or strawy) and straw as sources of organic matter, has once again been proved.

Experiments in connection with soil cultivation continue to indicate that the cultivation of fallow lands in spring has a very favourable effect on the yields. In connection with these experiments chemists are attempting to find explanations for this phenomenon by tracing the processes governing nitrification and those by which plant nutrients are made available in the soil.

Varietal experiments with cereals (including the milling and baking value) are continuously in progress. At present special attention is being paid to resistance to rust, septoria and foot-rot. A few valuable new varieties are being made available to farmers this year.

Linseed varieties are being tested anew with a view to establishing a greater variety of plant types for cultivation. It is hoped that linseed will help to control root-rot in grain, while at the same time provision will be made for the production of oil and protein-rich products.

Preliminary experiments were carried out with selective weed killers with a view to the control of noxious weeds.

In so far as the construction of contour banks for soil-erosion control is concerned, the construction of run-off strips in the grain districts where no suitable grass strips can be made, has become a thorny problem.

Mechanical measures are at present being tested out. The systematic selection of suitable plants is necessary and breeding work must be carried out in this connection, in order that a suitable vegetal cover may be formed for dry areas to protect the run-off strips against large-scale scouring.

In the sphere of vegetable production extensive varietal experiments were successfully carried out with field beans, tomatoes, cabbage, sweet potatoes and potatoes. Varietal studies on sugar beans,

cauliflower, carrots, beetroot, cucumbers, pumpkins, muskmelon and watermelon were mostly unsuccessful, owing to the exceptionally dry weather and damage by wind. *Oidium* caused much damage to *Cucurbitaceae*. Various methods of planting were successfully tried out with peas, and in so far as potatoes are concerned, tests were carried out on the depth and width of planting, size of the seed and methods of fertilizing.

Owing to the shortage of personnel, most of the experiments on agronomy and vegetable breeding have not yet been statistically analysed.

Research work on tobacco was directed mainly at the breeding and testing of various varieties of Turkish tobacco, seed-bed technique, fertilization, cultivation methods and methods of curing.

This work is greatly hampered by the fact that the data have to be collected during harvesting time when the duties of the tobacco officer in regard to extension work are heaviest. There is only one officer; consequently he cannot give full-time attention to any one part of his activities.

Animal Husbandry.

The activities in connection with the testing of the digestibility of acorns, as well as the influence of the tannin content on digestibility, and the work in connection with comparative studies of the blood of cows with milk fever and that of normal cows, was abandoned owing to the death of the research worker concerned.

Considerable progress was made with studies in connection with the nutritive value of silage of various plants, but owing to the shortage of personnel, the results have not yet been elaborated and recorded.

With the assistance of a post-graduate student, research work was carried out on the influence of sheep sorrel (*Oxalis cernea* Thumb), a noxious weed in lucerne and other grazing. The influence of oxalic acid on mineral metabolism was also investigated. Proportions were worked out in respect of calcium, phosphorus, magnesium, potassium, nitrogen and oxalic acid, and since sheep sorrel is rich in iron, haemoglobin determinations were made on the blood. The analytical work is almost completed.

Sterility or poor semen in bulls is often the cause of uncertainty in selection for fertility in female animals. Since three bulls from the college stud were temporarily or permanently sterile, and a large number of cows and heifers did not become pregnant, it was necessary to test the semen of stud bulls regularly, and it was decided to apply artificial insemination in the herd, and to test the semen before every insemination. Meanwhile investigations are being carried out on the technique for determining the quality of the semen and on methods of preserving the latter. Approximately 80 per cent. of the inseminations were successful the first time.

The injection of sterile bulls with ascorbic acid for producing fertility in the semen was also tested out, but the results were negative, probably because there were abnormalities in the tests of both bulls, as was revealed by a post-mortem examination.

Breeding experiments are being carried out with the object of breeding a pig breed with the colour of the Tamworth and the good carcase qualities of the Large White. The F_1 's and F_2 's of the Tamworth \times Large White crosses are mutually inbred.

As regards meat research, the experiments in connection with the keeping quality of meat were abandoned owing to the death of

the officer concerned. Routine measuring of all lamb carcasses, in connection with the progeny experiments with Dormer ram lambs before they are used in the stud, is still continuing. The measuring of pig carcasses in the comparative studies in connection with feeding and breeding experiments is being continued.

It is intended to make a careful study during the coming year of the sexual cycles of German Merino and Dormer ewes with a view to selection for early mating. The acute shortage of protein-rich feeds has also led to a careful study of the utility value of fish offal as cattle feed. Approximately 50 head of cattle out of just over 200 in the College herds contracted lumpy-skin disease, but there were no deaths. One bull became permanently sterile and two only temporarily. The average yield of the Jersey herd for the past testing year (20 cows of which only 6 are mature) was 8,096 lb. of milk and 467 lb. of butterfat, testing on an average, 5.771 per cent. The average of the Friesland herd (59 cows, of which 26 are mature) was 13,388 lb. of milk and 501 lb. of butterfat with a fat content of 3.807 per cent. Thus, throughout the year the Friesland herd produced on an average, practically 4½ gallons of milk per day per cow.

The German Merino flock is at last registered in the South African Stud Book. The sheep have already been approved. It is the intention this year to allow the German Merino as well as the Dorman ewe lambs to mate at the age of 7 months, in order that they may lamb at the age of one year.

Genetics.

The division of genetics is paying particular attention to the breeding of a large variety of plants. The breeding work in connection with wheat is making good headway. Efforts are being directed mainly at the production of varieties which are immune to rust and foot-rot. Much attention was paid to the wheat × rye hybrids made fertile by means of Colchicine treatment of the first hybrid generation. With the assistance of the division of genetics the resistance of foot-rot and rust is at present being tested. During the course of the year it will be possible to determine the approximate baking quality of the rye × wheat hybrids. Great expectations are cherished from these hybrids. A similar progeny series of *Agropyron* × *Triticum* is also being tested out.

Approximately 4,000 different other wheat selections from segregating populations are also being studied. Many of the selections already breed pure and will shortly be tested against the best commercial varieties.

Oat selections (399) from segregating populations are being tested for resistance to crown and stem rust. Many of these already breed pure. The inbreeding of rye from a number of varieties to eliminate undesirable characteristics and maintain trueness to type, is progressing very favourably. Small quantities of seed from the first open pollination are being supplied to farmers. There are 167 barley selections which are being studied.

In the sphere of vegetable breeding, improved varieties of Cape Spitzkool, parsnips, carrots, beetroot, tomatoes, leeks, onions and beans are being produced by means of selections, inbreeding and hybridization. Progress has already been made with the elimination of untimely seeding and the improvement of quality and uniformity in Spitzkool, carrots, beetroot and parsnips.

Among fodder crops most attention was paid to kale, and a type of kale which does not run to seed too early and which yields excellent crops, has already been obtained. Further selection is being carried out with a view to obtaining greater uniformity.

Systematic selection has been carried out with lupins which have become very popular as a cover crop in orchards and vineyards, and also as a fodder crop, in order to eliminate hardness of the testa in the seed. Great progress was made with the blue bitter lupin, but progress is much slower with the yellow sweet lupin.

Attention is also being paid to the breeding of stocks, sweet-peas and garden lupins. Owing to vacancies and a shortage of personnel the breeding of legumes, especially as a pasture crop, is receiving no attention. It is becoming increasingly clear that plant breeding ought to play a much more important rôle in agricultural research than formerly. Problems in regard to diseases, insects and crop rotations can often best be solved by the breeding of adapted plants which are resistant to diseases and insects.

Entomology.

Owing to the limited personnel, research work with regard to insect control was concentrated on a limited number only of the most troublesome pests with which farmers have to contend.

The cutworm pest, *Euxoa segetis* Schiff, and *E. subalba* Walk, was examined from various angles. It was established that with the use of bait very many more moths are caught 6 feet above the soil than at a height of 2 and 4 feet. It is possible that an even greater height may be better still. More than 60 per cent. of the moths caught were females, and eggs were found in more than 75 per cent. of the females.

The fact that bran was unavailable for poison bait made it necessary for recourse to be had to substitutes.

Cabbage leaves proved a very satisfactory substitute, but antelope grass, tobacco dust and others were less satisfactory.

In another experiment with potatoes it was determined that some varieties were damaged to a greater extent by cutworms than others. Flourball and Kathadin are particularly susceptible, whereas Kurr's Pink and Arran Chief are, comparatively speaking, affected in a far lesser degree.

The eelworm pest (*Heterodera marioni* Cornu) (Gooday) is still causing severe damage to vegetables and some flowers. In field experiments it was abundantly proved that bean varieties vary considerably as regards susceptibility to the disease. So, for example, it was found, that the varieties Idaho Refugee, Long Tom, Victory and Canadian Wonder are infected to a far smaller extent than the varieties Burpee, Kudu, Stringless, Full Measure and Tender Green.

The Aleurodid vegetable pest which has, preliminarily been identified as *Trialeurodes natalensis* Corb. caused considerable damage at Montagu and Worcester during the period January to May 1947. A commencement was made with a study of the habits and general biology of the pest. Material is being prepared for testing out control measures.

Experiments in connection with the control of vine weevils were carried out at Elsenburg. Very promising results were obtained with a mixture of D.D.T. and sulphur. This remedy was decidedly better than potassium arsenate mixed with sulphur, or the old lead-arsenate remedy.

Plant Diseases.

The officer of the Plant Pathology section has a very extensive lecturing programme, and with the present personnel, finds it impossible to carry out this programme properly. The extension work takes up much time since it is accompanied by laboratory work for identifying the causal organisms of the disease.

Considerable attention is being paid to foot-rot disease in grain. The fungus *Ophiobolus graminis* and the related fungus *O. graminis* var. *avenae*, are the culprits. In a micro-biological seed survey it was found that the former is not transmitted by seed to any great extent. The results also indicate that there are no seed treatments which are likely to be of any value in the control of foot-rot.

It was found, however, that foot-rot does not only attack wheat, but also various wild grasses, such as *Bromus maximus*, *Briza Spp.*, *Bromus sterilis*, and *Hordeum murinum*; and since all these grasses are abundant in the grain areas and also in lucerne pastures, it is not surprising that foot-rot has been found in epidemic proportions in wheat on soil planted to lucerne pastures for seven years. By fallowing and keeping the soil free from weeds, all hosts will be destroyed, and this will serve as a much better control measure for foot-rot than the planting of lucerne pasturage before the wheat is sown. Unfortunately, this practice runs counter to the soil conservation measures recommended.

Extensive experiments are being conducted to determine whether any wheat variety is resistant to the fungus. Up to the present no single known variety has been found to show any such resistance.

A commencement was made with studies in connection with rust in cereals, especially with a view to the breeding of rust-resistant varieties.

Various diseases in vegetables were investigated but serious attention was paid only to the following three, viz—

- (a) Storage rot in sweet potatoes. This work is now reaching the final stage and storage methods which may confidently be recommended to farmers, have been devised.
- (b) Oidium in pumpkins, watermelons, coarse-skinned and winter musk melons was investigated and very satisfactory results obtained. Final experiments with squashes as test plants are being carried out at Welgevallen during the coming summer.
- (c) A preliminary study was made of the control of krommek, a virus disease in tomatoes, as a guide, and promising results were obtained from these observations. During the coming summer the work is being continued in large-scale experiments.

It is the intention to entrust an officer exclusively with the investigation of virus diseases.

During the summer he will qualify in serological technique at Onderstepoort in order to be in a position to undertake the identification of viruses.

Viticultural Oenology.

Long-term experiments in connection with fertilization, cultivation, trellising, topping and pruning were continued in the normal manner. The results are more or less in keeping with those of previous years. Experiments were also carried out on various methods of grafting and on callous of vines.

Fairly extensive varietal studies and selection work with grape varieties are in progress and promising results are being obtained.

Experiments with cover crops in vineyards revealed that lupin varieties selected with a view to the elimination of hardness of the testa, yielded good results, whereas wild lupins were disappointing.

The control of weevils was tested in collaboration with the entomologists.

A series of wine-making experiments is in progress, viz.—

(1) Proof wines of previous years are still being examined regularly.

(2) In the cellar at Welgevallen the experiments on the making of Vintage Port wine and on blending for the making of Burgundy wine were continued. Very promising wines were obtained. The results form the basis for future experiments on a larger scale.

(3) In respect of 45 vineyards established in collaboration with the K.W.V. on 19 different farms, 40 samples were pressed during the past season—11 at Riebeeck, 5 at Bonnievale, 3 at Elsenburg and 21 at Welgevallen. After fermentation the wines were brought to the K.W.V. cellar for storage and maturing. It was difficult to obtain vats and a few samples of wine were irreparably damaged. Thus far, the most promising samples are Port wines which show marked and interesting differences with various grape varieties and on different soil types. The work up to the present points to the advisability of placing the pressing in the hands of the Institution, and of allowing the products to mature in cellars on the premises rather than at the K.W.V.

(4) Experiments in connection with the maturing of brandy were continued. Among others, six new blendings of rebate brandy and spirits were made and are being left in wooden vats to mature. A large number of samples were taken and have already been analysed in detail.

(5) Fermentation experiments are being continued with wines which ferment with difficulty when dry. Laboratory experiments have revealed that the settling method apparently removes substances which are essential to the good action of the yeast cells. Must which had not settled and selected yeast fermented well. Attempts to bring about good fermentation in settled must by the application of various yeast foods had little effect.

(6) Experiments were carried out with certain red and white wines to determine the value of the addition of tartaric acid and citric acid during fermentation. The degree of acidity, acid separated out and the quality of the wines are being traced.

(7) A commencement was made with the isolation of yeast cells and of pathogenic bacteria in wines.

(8) In the field of chemistry a series of experiments are also in progress, viz.—

(a) Methods of analysis for wines and brandy are being examined systematically. An attempt is being made to manufacture pure alcohol for combustion analysis by means of fractional distillations instead of chemical purification.

(b) A study was made of the absorption of heavy metals and nitrogen by the vine, their immobilization by annual shoots, and the grape, and of the rôle played by these in turbidity of wine. The grapes are sampled and analysed for this at various stages of growth, and also for sugar and acid. The soils on which the vines are cultivated

were sampled at various depths. At length, the wine which has fermented dry is sampled and analysed each time it is racked off. It is the intention to repeat this work for three years in order to gain a clear idea of the distribution of heavy metals and nitrogen in the plant and their effect on the final product.

Agricultural Chemistry.

Nitrification studies in various systems of crop rotation are being carried out in collaboration with the Division of Agronomy. The results indicate that if lucerne is used as a grazing crop in the rotational system, the available nitrogen for the subsequent cereal crop is increased. The absorption of phosphates and nitrogen by the young cereal plants is examined and finally the amount which remains in the straw and cereals is determined. As time goes on the duration of the residual effect of lucerne will also be determined.

Fertilizer experiments suited to various systems of rotational cropping are now being laid out at Mariendal. In these experiments an attempt is being made to determine to what extent lucerne can mobilize the reserves of phosphate as well as the less available rock phosphate.

Fertilizer experiments were carried out with wheat in the Swartland and will be extended still further.

Studies are also in progress for determining the capacity for phosphate immobilization in certain types of soil in the winter-rainfall area.

A detailed soil survey is being made of the Tygerberg conservation area. The shortage of staff is retarding the soil survey of the grain district. The whole of the Swartland area has been surveyed and the results are being prepared for publication. The results of field experiments over the past seven years with the most important vegetables on the Cape Flats are being statistically elaborated. Apart from these field experiments, two series of pot experiments with beans are being carried out on a sour and on an alkaline soil from the Cape Flats. The actual manganese absorption on these types of soils, as well as the residual effect, was determined. The methods of application of manganese were also studied. Besides this work, the Cape Flats was also described in respect of the situation, topography, geology, climate, vegetation and population. The whole study is now being prepared for publication.

Another experiment which yielded interesting results was the determination of the assimilation of the nitrogen in a number of organic fertilizers. The work is performed in large pots with barley as the experiment plant. A comparison is being made between Karroo manure, two types of compost organo, mafurra meal and ammonium sulphate.

A statistical analysis was also made of all the fertilizer experiments carried out from 1923 to 1930.

Poultry Breeding.

Owing to the inadequate personnel and the fact that the only officer in this division had to cope with all the university and diploma lecturing as well as extension work, no research work could be done. With the help of a technical assistant, however, the poultry stud was maintained. All hens are tested for production by means of trap nests and the breeding takes place purely on a stud basis. For this work a large number of records have to be kept.

Strengthening the South African Fruit Industry.

R. I. Nel, D.I.C., D.Sc. (Agric.), Director, Western Province Fruit Research Station, Stellenbosch.

A. Fruit Research Station.

NO one will begrudge the fruit farmer the measure of prosperity which the past season has brought him, after his difficulties during the war period. There is, however, a real danger that the high export returns will, as after the previous war, result in a considerable amount of injudicious planting. A minor planting "boom", together with all the evils associated with a short supply of recommended and suitable varieties, has in fact commenced.

With the many inherent weaknesses of the deciduous fruit industry, reconstruction of its varietal structure is a primary post-war need, not only to secure more economic production, but to conform more satisfactorily to the changing demands. The internal consumption of fruit has increased enormously during the war, and is likely to rise in the future, with increasing industrialization and urbanization and the development of the new gold fields. Many of the varieties grown for export are not popular locally or suitable for processing, and there is definite need that consideration be given also to the home market when laying down new orchards or top-working existing plantings. These and the numerous other technical problems affecting the production and disposal of deciduous fruit are the special responsibility of the Fruit Research Station. To this end it carries out advisory and research work into all cultural problems as well as into the transport, storage and processing of fruit.

Advisory Services to Fruit Growers.

The Institution was extremely hard-pressed to meet the heavy demand for technical guidance by fruit growers. This has grown to such an extent that research and investigational work is being interfered with unduly. As highly specialized advice is required in most instances, the stage has been reached where specialist-advisory officers will have to be attached to the various technical sections, and the number of sub-stations increased.

In addition to the advice given by letter or by telephone, 2,556 farm visits were made, usually by teams of experts, to advise fruit growers on their farms. Radio talks totalled 27. The annual fruit-farmers' day at the experiment farm Bien Donne, showed a record attendance of well over 700 fruit growers. A gratifying feature was the demand for special farmers' days and meetings by growers in particular localities; 82 meetings attended by 2,184 fruit farmers were held. Visitors to the laboratories, offices and experiment farms exceeded 3,000; in addition to visits by individual growers, several groups of growers and members of a scientific society spent the day seeing the work of the Institution. In addition to the staging of educational exhibits, judges and stewards for fresh and dried fruits were provided at some of the principal shows in the winter rainfall area.

To assist the many newcomers and young farmers commencing fruit farming, a special beginners' course of one week was given

STRENGTHENING THE FRUIT INDUSTRY.

during July. In an additional series of lectures and demonstrations, the particular problems of the table-grape grower were treated. The courses were well attended and greatly appreciated.

Technical Assistance to Other Bodies.

Technical advice was again extended to canning and dehydration factories and dried-fruit packers, a total of 50 visits having been made for the purpose. A considerable amount of technical assistance was also rendered to firms manufacturing or marketing insecticides and fungicides, or carrying out contract spraying.

As before, the Deciduous and Dried Fruit Boards were assisted with technical advice, and all meetings attended. Officers of the Institution were also in attendance at the annual agricultural congresses of the South-Western and Western Cape Districts.

Other Divisions and Departments were again assisted as far as possible. The help given included inspection of seed potatoes (28,000 bags) and bulls (247) for the Division of Soil Conservation and Extension, spectrochemical analyses for the Division of Botany and Plant Pathology, extension of spectrophotometric facilities to the Low Temperature Research Laboratory, analyses for the Public Health Centre, Knysna, in connection with nutritional studies, and assistance to the Division of Economics and Markets in connection with marketing and grading regulations. The Controller of Fertilizers was again assisted in the allocation of fertilizers to fruit and grape growers.

Co-operative Experiments.

Apart from the usual "demonstration" type of co-operative experiment, where the applicability or superiority of known practices is brought home visually to the farmer, this Institution concentrates on what may be termed the "investigational" type of farm experiment, where a solution to local problems is sought, and the farmer-co-operator in fact provides an "experimental" rather than a "demonstration" plot. A total of 204 co-operative experiments have been laid down, all essentially of a long-term nature.

More than half of these experiments are concerned with the testing of new varieties and rootstocks in the more important fruit-growing localities. In the older experiments some 5,000 experimental trees were planted under 122 different sets of soil, climatic and orchard conditions; in the experiments laid down more recently, some 3,000 deciduous fruit trees involving 130 different stock-scion combinations are being tested in 8 districts. All the material is grown or supplied by the Research Station. The older experiments are already beginning to show results and will be of inestimable benefit to growers undertaking new plantings or wishing to renovate their orchards.

Large-scale co-operative trials with strawberries have been undertaken in the coastal belt, ranging from Bredasdorp to Stellenbosch, and to a more limited extent with gooseberries, for both of which there is a keen demand by processors. A total of about 60 acres is at present devoted to co-operative experiments with berry-fruits. Trials with subtropical fruits so far comprise mainly olive variety plantings in the milder parts of the western and north-western Cape Province.

Other aspects of fruit-growing covered by co-operative experiments include orchard practices such as pruning, top-working, cross-

pollination, spraying measures against delayed foliation, use of hormone sprays to control pre-harvest drop of apples, practical methods of controlling manganese deficiencies in peach trees, control of zinc and manganese deficiencies in apples, chlorosis in subtropical fruits, marginal scorch and chlorosis in berry plants, spray treatments against pear scab, apple crack and apple mosaic to fit in with local codling-moth spray programmes, control of peach mildew, control of codling moth and other pests, biological control, mulching and irrigation, and the reclamation of "brak" or alkaline soils. Co-operative experiments are gradually being extended over the more distant fruit-growing localities where there is an urgent need for this type of work.

Research.

Agricultural-Meteorological Studies.

Detailed climatological data were taken on the same lines as before at the main meteorological station at Bien Donne, Groot Drakenstein, as well as meteorological data at the 12 sub-stations in the main fruit areas. An additional sub-station has been established at Citrusdal; the establishment of additional urgently needed climatic sub-stations in the more distant fruit areas can only be considered when the staff position improves. With the erection of a wind-direction recorder at Bien Donne, the continuous registration of wind-direction has become possible.

Monthly reports analysing the influence of climatic conditions on growth and fruit crops are prepared in addition to a comprehensive annual report.

Applied studies during the year included the influence of weather conditions from January to May on the ripening of wood and leaf-fall in fruit trees, and the influence of winter temperatures on fruit production. With the favourable winter temperatures experienced during 1947, a good fruit crop may be expected on the whole during the 1947-48 season.

Climatological studies included the solar radiation survey at Groot Drakenstein in co-operation with Onderstepoort, the comparison of mean, maximum minimum and mean winter (June and July) temperatures for Groot Drakenstein and Stellenbosch for the period 1941-1946, and the investigation of rainfall intensity and of soil temperatures at Stellenbosch and Groot Drakenstein. The meteorological study of air pressures over New Zealand in relation to the local winter rainfall was continued.

Improvement of Fruits.

Both producer and consumer are suffering to-day from the late start made in selecting and breeding varieties of fruit suited to local climatic and soil conditions and meeting the needs of the various channels of disposal. The lack of vigour, irregularity of bearing, susceptibility to pests and diseases, or poor keeping quality shown by so many of the varieties grown, mean high production costs and enhanced prices to make good the losses during transport and storage.

As a result of 7 years of painstaking breeding and controlled crossing a large number of fruit seedlings of known parentage have been produced at Bien Donne. Attention has been focussed mainly on table grapes, peaches, apples, guavas and strawberries. Many of

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the hybrids have reached the fruiting stage and the promising types are being propagated to undergo comparative tests under a variety of conditions against the standard commercial varieties.

As it became evident that much more breeding material was required and that personal contact with overseas genetic work would greatly facilitate further progress, Mr. Steyn, the geneticist of the Institution, was sent overseas in March 1947. Reports received from him indicate that his mission will be of very great benefit to the fruit industry.

Pomological Investigations.

In view of the all-important part varieties play in the new fruit industry in the making, a great deal of pomological work has centred round the testing of varieties and rootstocks, with special reference to suitability for different areas and the various channels of utilization of the crop.

Varieties.

Deciduous Fruits.—The following are being tested at present in the variety orchards at Bien Donne: 185 peach and nectarine, 41 pear, 23 Japanese plum, 67 European plum and 20 apricot varieties. Most of the stone fruits are already well in bearing. Detailed records are taken annually on time and duration of blossoming period, number, weight, and size-range of fruit and time of ripening, the quality and potentialities for dessert, drying and canning being also investigated. In the peach varieties the relative susceptibility to delayed foliation receives special study. Within a year or two these tests should yield some very important results and it is hoped that more varieties of the calibre of the popular *Kakamas* and *Boland* will be available to the industry before long.

The Groot Drakenstein area is not suited to apples and the Research Station is in great need of permanent experimental plots where similar detailed work can be carried out on apple varieties.

Sub-tropical Fruits.—In the testing orchards at Bien Donne a number of sub-tropical fruits are undergoing trial in the same way as deciduous fruits, only on a smaller scale. Amongst avocados, the variety *Fuerte* appears to be a consistently good and regular bearer under Western Cape Province conditions; other promising varieties are *Ward*, *Mayapan* and *Nabal*. The pecan nut varieties planted some 7 years ago are well in bearing, *Nellis*, *Halbert* and *Moore* being the best yielders so far.

It is clear that the olive thrives under a variety of conditions in the western Cape Province and that it should in future form a profitable side-line to the deciduous fruit industry. Extensive experimental olive plantings along the Olifants River indicate that this fruit does exceptionally well in that part of the north-western Cape Province. Figs and persimmons also appear to be at home there, but avocados have proved disappointing so far.

Particular attention was paid to guavas. In addition to the variety tests of commercial and promising new types, some 6,000 hybrids are undergoing intensive selection.

Berry Fruits.—29 new imported varieties of blackberries, raspberry-blackberry hybrids and dewberry-crosses were planted out for testing at Bien Donne. In addition, 4 new strawberry varieties were introduced from England, U.S.A. and Tasmania. In the bramble trials, *Boysenberries* yielded 2·7 tons, *Lowberries* 2·5,

Youngberries 5.2 and *Thornless Youngberry* 6.1 tons per acre. As in the past, the *Thornless Young* again proved the best cropper.

Experiments with Cape gooseberries showed the need for seed selection and proper fertilizing methods. Heavy frost (minimum air temperature 30.5° F.) at Bien Donne, proved to be fatal to Cape gooseberries, the plants being killed to soil level; this was a serious setback to the field trials.

As the climate at Bien Donne is in many respects unfavourable for commercial strawberry culture, experimental work with this fruit is now being limited to co-operative trials in more suitable areas.

Rootstocks.

The pear, plum, prune and apricot rootstock experiments at Bien Donne are making excellent progress and some striking differences in the size and bearing capacity of trees are already discernible, as is also the case in repetitive tests in other localities. In the case of the apricot, for instance, some of the myroblan-stock types, so extensively used in Europe and the United States, are in most cases proving to be inferior to some of the local plum types. Last summer was one of the driest on record and interesting differences in drought resistance between rootstocks became evident. The rootstock work is, however, long-range in nature and the trees must stand the test of time before definite recommendations can be made.

The experimental nurseries are a very important adjunct to rootstock and varietal research work. Apart from the fact that these nurseries supply practically all the trees for the rootstock trials at Bien Donne, and for the numerous co-operative experiments, trees are also raised for all types of field experiments carried out by the various sections of the Institute. Thousands of trees and cuttings were also supplied to other research institutions, local and overseas, and to the Department of Lands for planting on its settlements.

Orchard Practices.

In a pruning experiment commenced four years ago on *Kakamas* peach, the most important and widely planted canning variety to-day, the results obtained so far clearly indicate that disastrous results follow neglect of pruning. Unpruned plots showed a mass of dry and dead wood and broken branches, and even with drastic pre-thinning of the fruit, 60 per cent. of the crop was undergrade. The best treatment was a fairly severe type of pruning, coupled with a moderate topping of all long and willowy laterals.

In pruning trials at Ceres, on the *Winter Nelis* pears, a notoriously irregular bearer, striking results were obtained. It was found that this variety requires a more severe type of pruning than most other pear varieties, and that weakly fruit spurs could be invigorated and made fruitful by spur-pruning. The low production of *Winter Nelis* in Ceres appears to be largely due to insufficient pruning, coupled with a lack of cross-pollination.

In pruning experiments with berry-fruits it was found that pruning reduced yield.

A number of pollination experiments were again initiated. It appears that the seed-content of apples and pears is correlated with the adequacy of cross-pollination and that the grower can make use of this to determine whether his orchards need special or additional provision for cross-pollination.

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In top-working experiments at Elgin and Ceres, further evidence was obtained that mature apple and pear trees can be profitably regrafted by the new stub-grafting methods, which are superior to the older methods in use. The higher initial costs of stub-grafting is soon off-set by the earlier and larger yields obtained.

Delayed Foliation.

In the experiments on delayed foliation in early peaches, late pruning again proved to be most effective means of counteracting this trouble and resulted in yield increases of 105 per cent. and 18 per cent. respectively in the case of *Early Dawn* and *Peregrine*. Tests have been commenced on the use of dinitro-cresol as a corrective for delayed foliation in *Elberta* peaches.

The use of dormant oil sprays to ameliorate the harmful effects of delayed foliation was the subject of considerable investigation some years ago. A new series of experiments was commenced on prunes and apples to obtain more exact data on the correct timing of spray treatment and improvement of the efficiency of the oil sprays by the addition of D.N.C. (dinitro-cresol).

Culture of Table Grapes.

New Experiments at Paarl.—One of the main tasks of the past year was to replace the greater part of the old vineyards at the Paarl Viticultural Station, which had served their purpose, with new experimental plantings. These include (1) a large randomized experiment covering one morgen for studying the performance of two varieties of table grapes on different trellising systems, (2) a large planting-distance experiment in which systems of nitrogen application are also studied, (3) two rootstock experiments, (4) an experiment on soil-preparation systems, and (5) a collection of promising and decorative varieties. This new lay-out will greatly enhance the value of the experiment station to Paarl and other table-grape growers.

Pruning, Topping and Thinning Experiments.—The more important findings may be summarized as follows:—

- (1) In *Alphonse Lavallée* gentle tipping (removal of extreme tips only) of all shoots by hand four times, commencing at the period of inflorescence, produced an average crop increase of 39 per cent. and improved quality by 119 per cent. over six years.
- (2) A seven-year experiment with *Muscadel* grapes has shown that this variety should be cleared very early, in April or May, as soon as the leaves have dropped, and that the canes should be shortened during July or August, and not in June. This probably also applies to other early varieties such as *Waltham Cross*, *Alphonse Lavallée* and others.
- (3) Quality is enhanced in *Hanepoot* by long-pruning.
- (4) There is no special advantage in the pre-thinning of inflorescences of *Hanepoot* before flowering.
- (5) Bad setting of berries in *Hanepoot* can be very effectively counteracted by topping heavily at the commencement of the flowering period, followed by light hand-tipping of all shoots and laterals a week later. Setting improves to such an extent that bunches may even become too compact!

- (6) The expense of berry-thinning—the main single cost-item in the production of table grapes—can be considerably reduced by stripping one side of the bunches and following up with one judicious thinning.

Ampelographic work and long-term investigations on rootstocks were continued. An additional experiment on cultivation has been laid down on depth of ploughing and the effects of mulching and sub-soiling.

Physiological Investigations.

Many physiological problems of fundamental importance to the fruit-grower could not be tackled owing to shortage of staff and failure to obtain delivery of a special glass-house from overseas. Many valuable results have nevertheless been obtained with the limited personnel and facilities available.

Plant Hormones.—A considerable portion of the apple and pear crop is often lost before it has reached the correct stage for picking, with the result that growers tend to pick the fruit in an immature stage, to the detriment of quality and storage-life. By preventing the formation of the abscission layer in the stalk of the fruit, hormone sprays have become of considerable economic importance. A further series of experiments were carried out to determine the most effective methods of using these sprays in the more important commercial varieties of apples, and the influence of certain insecticides on the effect of these sprays was also studied. Savings of from 5 to 26 per cent. of the original crop were recorded, which is regarded as very satisfactory. The addition of nicotine bentonite to the hormone sprays did not appreciably lower the effectiveness. Because of the indirect as well as the direct benefits obtained, a number of growers are starting to use the hormone sprays on a commercial scale.

The experiment to ascertain the value of root-forming hormones in propagating olives from hardwood cuttings was continued. No work has been possible this year on the further elucidation of the factors controlling root formation in plants.

Nutritional Deficiencies.—The experiment to determine the most effective method of controlling manganese deficiency in peach was continued. Treatment of the soil by the bore-hole method, in which $\frac{1}{4}$ lb. of manganese sulphate is placed in each of eight holes bored into the root zone, proved especially promising as a method of obtaining good and lasting control of the deficiency.

Similar experiments are being carried out with apples for the control of manganese and zinc deficiencies.

Chlorosis and marginal scorching of leaves of Boysenberry, which has been found to occur in various areas, has been largely controlled by treatment with magnesium sulphate, and accentuated by applications of potassium. This result is in accord with the well-known antagonism between potassium and magnesium in plant nutrition and points strongly to magnesium deficiency being the cause of the trouble.

A chlorosis of avocado trees has been traced to a deficiency of manganese and practical methods of curing the shortage are being worked out.

Symptoms of deficiency in guavas are being investigated by means of sand cultures.

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Spectrochemical Studies.

Spectrographic methods are being employed to an increasing extent in the physiological and soil-chemical studies on the nutrition of fruit trees and vines. Work was hampered by the resignation of the two officers entrusted with this work, and of these only one could be replaced as yet.

During the course of the physiological experiments reported on above an interesting correlation was established between the manganese content of peach leaves and average yield per tree. The yield per tree increased as the manganese content increased from 16 parts per million to 66 parts per million; a further increase to 87 parts per million caused a distribution of the manganese: iron balance and greatly reduced the crop.

The spectrochemical analysis of a series of samples of orange leaves and soil from Citrusdal was completed, and 750 samples of vine shoots from different fertilizer plots prepared for complete spectrochemical analysis.

The new Beckman quartz spectrophotometer was set up and quantitative analysis for di-phenyl in cyclo-hexane as solvent carried out. The spectrophotometer proved to be capable of allowing rapid and accurate analysis of di-phenyl, vitamin A, D.D.T., etc. Pending improvement in the staff position, regular spectrophotometric analysis will not be possible.

Soil Classification and Soil Utilization Studies.

In view of the expansion of the fruit industry, and the need for re-orientation of plantings to secure more economic production, the systematic classification of soils in the different climatic areas according to their suitability for the cultivation of different kinds and varieties of fruit trees and other crops, has become a matter of great urgency. Enough progress was made prior to the war to show the fundamental importance and great practical value of this work which had to be suspended due to difficult transport conditions and lack of other facilities.

As a preliminary to the resumption of this work, which should be undertaken as soon as the staff position permits, a study was made of a number of soil profiles and the mechanical and chemical compositions of different layers and water tables in relation to root distribution and tree performance. The Division of Chemical Services is being approached for assistance with general soil classification and mapping.

Soil Fertility Experiments.

Nutrition of Grape Vines.—The elaborate experiment laid down some years ago to ascertain the effect of concentration and interaction of nitrogen, phosphate and potassium on the performance of *Waltham Cross* and *Barlinka* grapes on irrigated and unirrigated plots has shown the following important results:—

- (1) Regular irrigation gave significant increase in size and quality of crop in both varieties; the grapes developed a better colour in the dry plots, however.
- (2) Increasing the application of nitrogen from 100 to 600 lb. ammonium sulphate per morgen, significantly increased the crop and quantity of first grade grapes; additions of phosphate and potassium showed no effect.

- (3) Maximum crops of the highest grades were obtained in irrigated plots supplied with the maximum amount of nitrogen.
- (4) The effect of nitrogen application on the natural cover crops was outstanding.

Fertilizer Experiments with Prunes.—In this experiment at Tulbagh, now in its third year, the effect of varying applications of nitrogen and potassium on quantity and quality of crop and physiological disorders is being tested. In general the nitrogen plots are yielding larger fruits of higher grade, whereas no specific effect has been shown by potassium. Beneficial effects of nitrogen on leaf-colour, leaf-area and dropping and scorching of fruit are becoming evident.

Nitrification Studies.—In view of the importance of nitrogen in the nutrition of fruit trees, a series of field experiments was commenced at Bien Donne, in which the rate of nitrification of various raw materials, cover crops and fertilizers will be determined under natural field conditions, and of organic matter placed at various depths in the soil. The differential effect of ammonium sulphate and kraal manure, applied at various depths, on the performance of grape varieties is being studied at the Paarl Experiment Station.

Cover Crops.—The beneficial secondary effects of winter crops, especially legumes (lupines) on the nutrition of fruit trees and soil conservation have become increasingly evident. To determine the most suitable crop, time of planting and the specific soil-environmental requirements for establishing satisfactory stands, a series of test plots in the various fruit areas has been commenced. In addition to several plots at Bien Donne, plots were laid down in an apricot orchard at Wellington. This work suffered a setback by the resignation of the technical officer responsible.

Studies on Soil Moisture and Irrigation Practices.

Moisture Requirements and Time of Irrigation.—The vines for this fundamental study were planted in 1941. Crop and growth records have been taken to complete the uniformity test preparatory to applying the various treatments. As the irrigation piping has now been received, the experimental irrigation treatments will commence during the coming season.

Water Penetration and Moisture Conservation Studies.—In view of the great difficulty experienced in irrigating heavy impervious soils, and the large amounts of water lost by surface evaporation where holes or dams are used, the use of mulches was tested in a prune orchard at Tulbagh. The following outstanding practical results can be reported at this stage.

- (1) With straw mulch, 2 to 3 inches thick, penetration of water to a depth of 30 inches was secured after irrigation, whereas in the case of the bare plots penetration to a depth of only 18 inches was effected, with double the quantity of water.
- (2) Trees in the mulched plots retained their leaves longer and produced larger fruits of a higher quality than similar trees in the bare, unmulched plots.
- (3) On hot days the temperature of the soil under the mulch varied between 60 to 65° F., whereas in the unmulched plots it rose to 130° F.

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- (4) Six inches below the mulch the volume-weight of the soil after irrigation was 1.5 as against 1.7 in the unmulched plots, which were inclined to pan down.
- (5) Improved returns were obtained from mulched trees due to the improved grading of the dried fruit, viz. £1. 11s. as against £1. 2s. 4d., the cost of mulching being 1s. 3d. per tree.

A number of other mulching experiments are being laid down, including tests on the utility of various cover crops, as straw is not readily obtainable.

Packaging, Transport and Storage of Fruit.

Sulphur Dioxide Treatment of Grapes.—A considerable amount of work was again carried out on methods of sulphur dioxide treatment suitable for farm and large-scale commercial use, and on associated problems (packing, stacking, etc.). This work was carried out by the Biochemical Section with the co-operation of the Viticultural Section, and in collaboration with a field officer of the Deciduous Fruit Board.

The original apparatus for mixing and applying sulphur dioxide (SO_2) to gas chambers and trucks was redesigned with the result that a compact portable machine is now available which has proved very successful.

A further notable advance was the design and construction of an automatic sprayer in combination with a conveyor-belt system by means of which 20,000 lugboxes of grapes can be treated per day.

Thousands of boxes of grapes were treated by these methods. Three large experimental consignments were made, one each to Durban, Johannesburg and England. The following is a summary of the main results and conclusions:—

- (1) The beneficial effects of SO_2 on the keeping quality, general appearance, freshness of berries and stalks has been established in the case of grapes marketed locally and overseas.
- (2) The life of treated grapes is sufficiently prolonged to make possible good distribution on both overseas and the local markets.
- (3) Grapes can be treated at temperatures of up to 80° F., i.e. without special pre-cooling, and successfully transported to distant markets, e.g. Durban in airtight trucks.
- (4) Both fumigation with SO_2 gas and spraying with sulphite solutions can be successfully employed in treating grapes for local and overseas markets. The spray-method is probably simpler and slightly more effective in the case of grapes packed for export.
- (5) Treatment with SO_2 will permit the use of simpler and cheaper packs. From the data obtained it is clear that the half-lug pack and solid 3-inch tray-pack will, when treated, deliver grapes in better condition on the local and the overseas market, than the expensive export pack, untreated.

Prolonged Storage of Grapes.—Several commercial midseason varieties, *Alphonse Lavallée*, *Waltham Cross*, *Hanepoot* and early *Barlinka* were successfully cold-stored for 6 months by periodic

treatment with SO_2 ; both fumigation and spray treatments were effective. These findings open up the possibility of extending the marketing season of grapes by several months and smoothing out the marketing curve.

Picking and Storage of Kelsey Plums, Pears and Apples.—The mass of data accumulated during the past five years is being worked up for publication as far as the limited staff resources permit. The results of immediate practical value, e.g. picking stage, storage requirements, storage life and optimum ripening temperatures have been conveyed to interested bodies and growers.

Entomological Investigations.

Owing to the serious depletion in staff, investigational work had to be severely curtailed and was limited to certain aspects of the codling-moth problem.

Codling Moth.—During the past fruit season, pears, apples and apricots in all areas have been exceptionally free from codling-moth infestation. This is attributed partly to the unfavourable weather conditions for oviposition, and partly to the improved spraying methods and the use of more effective spray materials such as D.D.T., certain formulations of which were used extensively. While the results obtained against codling moth were extremely good, D.D.T. undoubtedly aggravated the Bryobia mite position wherever it was used. Cryolite was again used by apple growers with good results. The material is, however, too slow in action against the summer broods of the moth and its use results in an undesirably high percentage of fruit with "sting" marks.

Due to the exceptional spring conditions, losses in apricots were very limited and rarely exceeded 20 per cent. in the worst codling-moth areas, while damage to peaches and plums was negligible.

Two large-scale spraying experiments were carried out at Bien Donne (Zondernaam section) in which the relative effectiveness of a number of recently developed spray materials was compared. The results obtained indicate that—

- (1) benzene hexachloride sprays are ineffective against codling moth and more especially so under summer conditions;
- (2) D.D.T. was the most effective spray material tested; and
- (3) the "opelate" type of lead arsenate, the particles of which are plate-like, is far superior to the standard type where the particles are globular. The long-term spraying experiments at Elgin on foliage injury and codling-moth control were continued.

Biological Control of Codling Moth.—Owing to contamination difficulties, the artificial rearing of hosts, and consequently also the production of parasites, took place on a smaller scale than in the previous year. It is hoped to overcome the contamination problem by redesigning the inoculation cabinet and by improved methods of obtaining moth eggs.

Successful mass-breeding methods have been evolved in the case of the parasites *Pimpla heliophila* Cam, and *Cryptus species* (FR. 86). Pending further research, *Ephialtes caudata* Ratz. and *Cryptus sexannulatus* are being propagated by the customary methods, which necessitates much handling and uneconomic use of host insects.

Six field experiments were carried out during the year. In most of these, orchards receiving parasites and only 2 or 3 early sprays

of fixed nicotine were compared with neighbouring orchards of similar age and varietal composition which had received full spray programmes of 10 to 14 sprays, such spray materials as fixed nicotine, lead arsenate, D.D.T. and summer oil being used.

Although results with the parasite-cum-spraying method fluctuate considerably and foreshadow certain difficulties in putting the system into practical operation, they are on the whole encouraging. At Vredenburg, where by far the largest number of parasites was liberated, the results obtained were excellent and cannot be due to chance. At Rhone, where promising results were obtained last season, results were extremely disappointing. Here, however, parasite introductions were too few and too late, and it is considered that the low overwintering population of moth on this farm seriously limited the establishment and breeding-up of parasites such as *Pimpla* early in the season.

Other pests received only superficial attention.

Diseases in Orchards and Vineyards.

With some improvement in the staff position a wider field could be covered by the plant pathology section, than in the previous year.

Pear Scab (*Venturia pirina* Aderh.).—The following materials all gave good control against this disease in spraying experiments: Dithane D. 14 (Disodium ethylene bis-dithiocarbamate), phenothiazine (thio diphenylamine), fermate (ferric dimethyldithiocarbamate), lime sulphur mixture, Bordeaux mixture and copperoxide-chloride. Dithane D. 14 ($\frac{1}{2}$ per cent.), however, caused severe scorching of the foliage. The addition of bentonite to phenothiazine led to a reduction in spray injury. The trees sprayed with fermate ($1\frac{1}{2}$ lb. to 100 gallons) presented the best appearance of all treatments; this fungicide has the advantage of showing promising compatibility with the spray materials used against the codling moth.

Apple Crack.—Various spray and pruning treatments were carried out against this disorder in the Montagu district and confirmed previous conclusions that the cracking of Ohenimuri apples is a physiological disorder, not amenable to control by spraying as many growers believe. The incidence of cracking was markedly reduced by improving the vegetative growth of the trees by means of pruning, and particularly by thinning of the spurwood.

Apple Mosaic.—At Ceres, records taken over three seasons on vegetative growth and crops indicate that this virus disease has a dwarfing effect on the trees and reduces the yield.

Peach Mildew (*Spaerotheca pannosa* var. *persicae*).—The spray experiments at Ceres again indicated that lime sulphur mixture, applied in winter, will effectively check infestation of fruit the following summer, but not of foliage; for control on foliage, regular treatment with sulphur dust until the end of December gave the best results.

The relative susceptibility to peach mildew of the 185 peach varieties at Bien Donne is receiving special study, but no valid conclusions are possible as yet. In artificial infection studies on potted peach trees it was found that high humidities and comparatively high temperatures are conducive to the development of the disease, whereas free moisture checked its development. A special technique for studying mildew development by making periodic collodion membrane impressions was evolved.

Other diseases of tree fruits studied included a fig disease of unknown cause, and avocado blemish [*Phytophthora syringae* (van Hall) Smith] which has been found to occur at Clanwilliam and at Bien Donne.

Bacterial Blight of Vine, or Vlamssiekte [*Erwinia vitivora* (Bacc.) du P].—A long term experiment is in progress at Constantia to establish the relative susceptibility of different grape varieties under field conditions, and in a heavily infected environment. In addition, a preliminary selection for resistant types is being made by artificial inoculation of more than 1,200 new grape-vine hybrids produced by the geneticist of the station.

Other experimental work yielded the following very significant information:—

- (1) The blight organism may be soil-borne. Pathogenicity tests with bacterial isolates from soils of infected vineyards gave positive results, whereas similar tests with isolates from soils of blight-free areas were negative.
- (2) Grape residues from wineries handling infected grapes may harbour the blight organism; bacteria isolated from grape stalks from such wineries gave positive results when inoculated into healthy vines.

Fruit and Vegetable Preservation.

The development of the fruit and vegetable preservation industry is reflected in the following statistical tables* :—

TABLE I.—*Expansion in the Union's Fruit and Vegetable Canning Industry.*

Year.	Number of factories.	Value of articles produced (£).
1928-29.....	10	517,622
1938-39.....	12	933,187
1939-40.....	14	1,360,963
1940-41.....	18	2,646,107
1941-42.....	17	3,312,305
1942-43.....	20	3,526,642
1943-44.....	22	4,930,302
1944-45.....	21	5,756,666

As shown in Table I, the number of factories was nearly doubled during the five war years; while the gross value of output increased by only 80 per cent. during the pre-war decade, the increase for the six succeeding years was 517 per cent.

Whereas the quantity of fruit used by the canning industry in 1938-39 was 53 per cent. greater than that used in 1928-29, the increase between 1938-39 and 1944-45 was no less than 435 per cent. (See Table II).

TABLE II.—*Quantity and Cost of Fruit Used.*

Year.	Fruit (lb.).	£
1928-29.....	28,310,733	113,545
1938-39.....	43,373,558	153,172
1944-45.....	231,892,970	781,772

* See Report No. 296, Board of Trade and Industries, 1947.

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The vegetable canning industry is a comparatively new development in the Union. While the value of production was of little significance before the war, the output expanded enormously during the war, increasing nearly ten-fold as shown in Table III.

TABLE III.—*Quantity of Vegetables Produced and Value of Output.*

Year.	Quantity produced (lb.).	Value of Out- put (£).
1936-37.....	3,345,637	46,618
1938-39.....	4,999,830	80,461
1940-41.....	17,282,501	315,417
1944-45.....	32,035,570	760,362

Much useful work was done by this Institution to assist the canning industry in the many problems that arose, *inter alia* by testing the suitability of different varieties of fruit and vegetables (in different areas) for canning and processing, by advising canners and growers, and, furthermore, by supplying a number of trained men to the industry.

It is clear, however, that as competitive conditions return and price considerations again exert their normal influence on the demand for preserved products, the prospects of the canning industry will depend much more on efficiency than during the war years. As efficiency in canning starts long before the raw materials enter the factory, and involves not only varieties and their cost of production but also efficiency of harvesting, handling and storage of raw materials, it is clear that much more intensive research will have to be conducted in future. It seems essential that research into the whole sequence of operations from the growing of fruit and vegetables to distribution of the finished preserved product be co-ordinated and linked with the research into the technical and economic problems of the industry.

Research was again hampered by the loss of trained men to the food industry. In addition to the preparation of a series of scientific bulletins on fruit and vegetable preparation, investigations were carried out on the following subjects:—

- (1) Suitability of new and standard varieties of fruits and vegetables for various forms of preservation, and the modifications in preserving practices to obtain the best results with specific types.
- (2) Effects of maturity at picking stage, locality and storage on canning life and quality of preserved pears and plums.
- (3) Chemicals for use in pre-treatment solutions, as preservatives and as hardening agents.
- (4) Storage tests on dehydrated and canned products and factors affecting the reconstitution of dehydrated vegetables.

Dried Fruit.

Nothing like the expansion of the canning industry has taken place in the dried-fruit industry. In 1937 the lowest recorded production of all kinds of dried fruits was experienced, viz. 12,745 tons, and the highest to date in 1942, viz 18,829 tons. This represents a substantial portion of the local fresh-fruit crop, and the problems of the dried fruit industry should not therefore be neglected. There

is an urgent need not only for more research on improved methods of drying, more efficient methods of handling, grading and packing of dried fruit, and of insect control, but especially for technical extension work on fruit drying amongst the thousands of farmers concerned. Large quantities of fruit which could be dried, are still wasted; and considerable improvement could also be effected in the quality of the fruit dried.

Investigations covered the following subjects:—

- (1) Effect of blanching on appearance and quality of product and on absorption of sulphur dioxide.
- (2) Dipping solutions for sultanas, raisins and prunes to improve quality and to economize on materials in short supply such as caustic soda and oils.
- (3) Storage tests.

Experiment Farms.

Bien Donne.—A notable event was the Royal Visit to Bien Donne on 20 February when the Prime Minister and the Minister of Agriculture were in attendance to demonstrate various aspects of fruit growing.

Improvements and expansions during the year included alterations to store-rooms and provision of a staff and change room, building of a labourer's double cottage, repair of protection bank along Berg River and extension of stone-pitching, clearing of 11 acres of land above existing vineyards in preparation for ploughing, draining and planting of 3 acres with apricots, plums and peaches.

Viticultural Station, Bellevue, Paarl.—One labourer's cottage was built, some 6,000 old vines removed and 3½ morgen prepared for new experimental plantings.

Publications.

During the period under review, 13 articles were submitted to *Farming in South Africa* and 5 technical bulletins published. In addition, a number of radio talks were prepared.

B. Dehydration and Cold Storage of Food Products.

On the secondment of Dr. G. M. Dreosti, Officer-in-Charge, to assume duty as Director of the newly established Fishing Industries Research Institute, it was decided to transfer the laboratory to the Western Province Fruit Research Station at Stellenbosch, the transfer taking place during July of this year.

Production of Dehydrated Foods.

The large-scale production of dehydrated vegetables by factories terminated when no orders could be procured for this type of product, but one factory is at present testing the South African market for dehydrated vegetables. The local demand for soup mixtures is still very uncertain, but an improved product with a possible brighter future is now being manufactured.

With the withdrawal of the inspectors from the factories, it was not possible to keep complete records of production, deliveries, prices, yields, trimming losses, etc., as was done in the past. It may be recorded, however, that 66 tons of soup-mixture were exported on behalf of the British Ministry of Food.

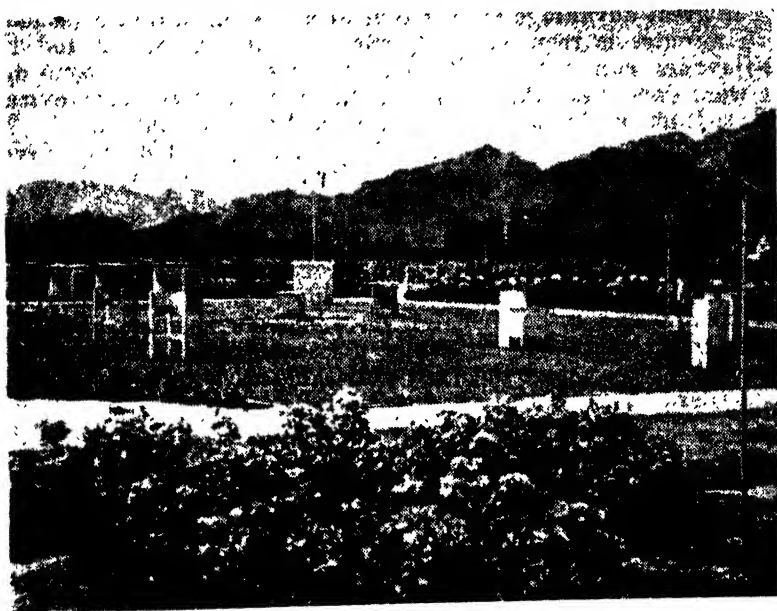
Food Analysis.

Several new methods of analysis, e.g. for carbohydrates, peroxidase in potatoes, etc., were tested and investigated. Altogether 2300 moisture determinations were done during the 12 months under review, as well as 600 enzyme tests, 575 sulphur dioxide determinations, 142 vitamin C determinations, 60 pH determinations (mostly on tomato purees and eggs) and a number of nitrogen and carotene determinations. In addition, approximately 1500 samples were tested for culinary quality and were scored for flavour, colour, texture and structure, by a scoring panel. A great deal of the testing work was done on behalf of food-processing factories.

Dehydration Investigations.

The many problems investigated include the following:—

Pre-treatment and storage tests.—Comparative tests on the keeping quality of enzyme-positive and enzyme-negative potatoes and carrots showed a slightly better retention of colour in the case of the negative products, but no marked difference was noticed in flavour. The texture of the negative samples, however, was much better. It was found that the heat-treatment of potatoes before compression caused a 50 per cent. decrease in SO_2 content and further destruction of enzymes, if positive products are used.



Recording instruments; Meteorological Observatory, Pien Donné.

During the recent glut of carrots, tests were performed to see whether fresh carrots could be stored in brine and sodium sulphite solutions. In the case of the sodium sulphite, a bad smell developed rapidly and the test was abandoned, but after 5 months in brine, the carrots still had a comparatively good appearance and flavour, after thorough washing. The keeping qualities of strips, slices and powders of carrots and potatoes were compared.

Mashed and riced potatoes.—The brush-sieve method for producing potato mash powder was tested out with untreated boiled potatoes, potatoes boiled in sodium chloride solution, potatoes

boiled in ± 10 per cent. calcium chloride solution, and mashed under different conditions. The best results were obtained by cooking the potatoes for 20 to 30 minutes in a solution of sodium chloride at atmospheric pressure, peeling, mashing when hot, cooling, and drying. Tests were also carried out on the dehydration of riced potatoes, a good product being obtained.

Soup-mixtures.—Originally the dehydrated soup-mixtures manufactured in this country were intended, to some extent, to serve as an outlet for good palatable dehydrated vegetables which had to be rejected on account of enzyme activity. The result was a product which was usually not of very high standard, and it was realized that the long cooking time required for most of these products was a serious drawback. Investigations were therefore conducted to explore the possibilities of pre-cooked dehydrated soup-mixes. The main problem was to find a means of dehydrating the ready-cooked puree. After many different tests the best procedure appeared to be to press out the surplus liquid by means of a juice-extracting press, to obtain a pulp of suitable consistency for extrusion in the form of noodles. To obtain the noodles the potato ricer was used, but as this method was considered impracticable for large-scale production other methods were tried and the best results obtained when the pulp was passed through a 4-mesh screen by means of a roller.

The great advantage of this type of soup-mix is that a period of only 5 minutes is required for preparation for the table, and that meat-flavours can very easily be incorporated in the soup-mix. Tests were done with the incorporation of meat stock, beef extract, liquid sodium glutamate, and powdered sodium glutamate. The last-mentioned substance imparted a somewhat unpleasant flavour to the soup, but the others improved the flavour considerably.

Storage tests showed that this soup stores well, even when it contains meat stock, but it is very essential that the fat should be removed from the meat stock before incorporation. It was furthermore found that the inclusion of milk powders in the old type of soup-mixtures had a detrimental effect on the keeping quality of the soup-mix. This was especially noticeable in the case of full-cream milk powder, and the least noticeable with roller-dried skim-milk powder.

Potato puffs.—To overcome the difficulties of the scarcity of vegetable oils and the development of rancidity in puffed dehydrated potatoes, the possibilities of air puffing were investigated. The apparatus devised in the laboratory gave good puffing, but the product had an unattractive flavour compared with oil-puffed dehydrated potatoes. Puffing in hot salt yielded a similar product.

Pineapples.—A number of tests on dehydration and storage were undertaken.

Factory-produced samples of pineapple slices kept fairly well when stored in open containers at room temperature, but deteriorated considerably in three weeks' time, when stored under tropical conditions. Storage tests on laboratory samples for different moisture contents and storage temperatures are still in progress. Investigations were also made to determine the best procedure for preparing this product as a dessert.

Chicory.—Tests on the drying of chicory were continued in the pilot bin-type dryer erected at Alexandria. Difficulty was experienced in obtaining even drying, and the cost of drying chicory

artificially proved prohibitive with the apparatus used. The drying of citrus peels was attempted in the same plant, but the same difficulties were encountered as with chicory.

Other Tests on Dehydration.

Mealimeal porridge.—A fortified mealimeal porridge for the Bantu School Feeding Scheme was dehydrated, and yielded a good product which reconstituted very well if ground finely after dehydration. Tests were also made on the dehydration of fish meal and crawfish bodies for cattle fodder. The crawfish bodies, which were minced and spread onto trays, dried very rapidly, one reason being that high temperatures could be used.

Eggs.—The development of mould on egg-boxes and spoiling of eggs were investigated in cold stores. Certain fungicides tested in the laboratory proved very effective in reducing mould on egg-boxes in cold store, without affecting the flavour of the eggs after prolonged storage.

Numerous samples of eggfiller-boards were tested in the laboratory in regard to suitability for long-period egg-storage.

Experiments were done to find a method for determining whether eggs had been dipped in an oil-wax mixture or not. Candling, microscopic investigation and permeability determinations were tried, and the last-mentioned method, after extraction with ether, gave promising results.

Mealies.—When it became evident that the estimated maize crop would be considerably above the average, and that the facilities for handling and storing the crop with the serious shortage of bags were totally inadequate, this laboratory undertook urgent work on the handling and storage of maize. The investigations involved numerous practical tests to verify calculations.

Seal oil.—Laboratory experiments showed that it is possible to extract seal oil from blubber at 40 lb. steam pressure by the addition of about 1 per cent. caustic soda. On the basis of this work, the laboratory designed and installed a pilot sealing plant on the S.S. *Gamtoos* of the Government Guano Islands Section, which is capable of handling about 5 tons of blubber per 10-hour day. Two officers of the laboratory accompanied the *Gamtoos* on trial runs.

Fish in tomato sauce.—Investigations were conducted to find the reason for the inferior quality, in general, of South African fish products canned with tomato sauce. It was found that the retorting of the fish together with the tomato puree invariably caused darkening of the tomato, and the development of a burnt flavour.

Albumen from fish.—A considerable amount of research work was done on the German process for the manufacture of "Viking" albumen from fish. The tests were done with stockfish and eventually a good product was obtained which had a greyish colour and approximately double the whipping power of egg-white when whipped with sugar, but it had a fairly strong fish taste. Drying of thin layers of foam on porcelain slabs was successful, but much better results were obtained when the product was spray-dried. A good product was also obtained from "Vaalhaai" with a whipping power $2\frac{1}{2}$ times that of egg-white, and further investigation on bleaching, etc., led to the production of a powder of yellowish-white colour with practically no fishy smell or taste.

The Government Guano Islands.

T. L. Kruger, Superintendent.

A total of 769 casual labourers were employed on the islands for the collection of guano and penguin eggs and to assist in building operations, and during the off-season 98 were retained to serve as boatmen and to assist in cleaning and renovating buildings. No fatal accidents occurred during the past year. Two labourers died, however, from natural causes.

Considerable progress has been made on the various islands with work on buildings and jetties, which had to be suspended during the war, but much still remains to be done, and several years will be required to complete all the necessary work.

Protection of Sea-birds and Seals.

The necessity for greater protection of the islands and prohibited areas has already been emphasized in the past and legislature is being contemplated to accomplish this goal. As the Department of Commerce and Industries is also interested in this matter, this decision was reached in consultation with that Department.

Guano.

The price of Guano, viz. £10 per ton, on which a subsidy of £1 per ton is allowed, remained unchanged. In spite of early and continual rains along the east coast, which made the collection of guano on islands in those regions impossible, the supply for the season was satisfactory and no difficulty was experienced in the exportation of the allotment of 6,500 tons. A heavy shower along the west coast after the collection was started, was responsible not only for a delay, but also for a reduction of at least 1 per cent. in the nitrogenous content of the guano.

The demand for guano is still increasing as reflected by the following figures:—

NUMBER OF APPLICATIONS FOR GUANO.

<i>Year.</i>	<i>Number of Applications.</i>
1945.....	6,414
1946.....	7,222
1947.....	7,555

NUMBER OF MORGEN UNDER CULTIVATION.

Wheat.	Vegetables.	Onions.	Potatoes.	Total.
493,132	26,051	14,822	67,010	601,015

Number of bags allotted.....	65,280
Number of bags taken up.....	63,208
Number of bags issued to Government Departments....	58
Value of free allotment.....	£56
Value of guano sold.....	£63,208

THE GOVERNMENT GUANO ISLANDS.

ANALYSIS OF THE GUANO.

	1943.	1944.	1945.	1946.	1947.
Phos. Oxide (Total).....	10·4	10·3	10·4	10·5	10·0
Phos. Oxide—soluble in 2 per cent. citric acid.....	9·4	9·5	9·9	9·7	9·2
Phos. Oxide—Soluble in water.....	3·2	3·1	2·7	2·7	3·2
Nitrogen.....	10·8	10·4	10·2	10·0	9·6
Potash.....	1·7	2·4	2·0	2·1	2·3

Penguin Eggs.

Since conditions were favourable, it was decided to collect eggs for the two successive years and 5,412 boxes of two dozen each were collected and sold at 10s. per box.

Sealing.

Large numbers of seals were taken both during the summer and the winter season. Details of the operations are as follows:—

Skins.	Colonial Preserves.	Northern Preserves.
Pups.....	3,945	4,615
Wigs.....	4,029	6,152

Of the pup skins taken during winter, 7,859 were suitable for export and were exported to the following countries:—

U.S.A.-7,584, England-150, Sweden-125; Total-7,859.

The rejected pup skins and all the wig skins were disposed of locally.

The following is the positions as regards skins exported to the firm Fouke Fur Co., U.S.A., since 1942:—

NUMBER EXPORTED.		NUMBER TREATED AND SOLD.*	
Year.	Number.	Year.	Number.
1942.....	2,030	1943.....	2,030
1943.....	11,101	1944.....	3,010
1944.....	6,000	1945.....	8,091
1945.....	3,973	1946.....	6,279
1946.....	7,584	1947 (April).....	2,349
		BALANCE.....	8,929
TOTAL.....	30,688	TOTAL.....	30,688

In view of the general shortage of fats and oils, every possible effort is being made to produce the maximum amount of seal oil, and during the past year 36,511 gallons were sold. The demand for seal oil considerably exceeds the supply. The supply during the year was as follows:—

Seal Liver.....	78,853 lb.
Shark Liver.....	2,821 lb.

Transport.

The acquirement of Departmental boats for conveying products to and from the islands has considerably facilitated the operations

of the Organisation and has proved a valuable factor in expediting the shipping of guano and other products. It is expected that in future the chartering of other vessels will no longer be necessary.

The S.S. "Gamtoos" is not only very well equipped for guano operations but has also been fitted with the necessary machinery for the manufacture of seal oil. The same machine can also be adapted to boil seal carcasses for the manufacture of meatmeal but as yet no suitable method has been found for drying the meat sufficiently to ensure that it will keep; and until a suitable press is found for the purpose, the manufacture of meatmeal cannot be undertaken.

The two patrol boats "Pikkewyn" and "Seabird" are proving eminently suitable not only for protecting the islands but also for delivering supplies to the islands. They are also used for the transportation of guano from the smaller islands, and in sealing expeditions.

Research Work.

Considerable progress has been made with the biological research undertaken since last year, and although it is too early for this work to yield any results, it is expected that in the course of time this work will be of great benefit both to science and to this Organisation.

Safeguarding the Union's Livestock Industry:—

[Continued from page 996.]

Dourine.

This disease is present in various parts of the Union. Owing to outbreaks of other scheduled diseases it has not been possible to continue or extend the block tests.

Newcastle Disease.

There were no outbreaks.

Non-Scheduled Diseases.

Tick-transmitted diseases, redwater, anaplasmosis and heart-water were prevalent and responsible for heavy losses.

Arsenic-Resistant Blue Tick.

During the year experimental work in connection with the use of the new dips (D.D.T. and benzene hexachloride) was continued and in this connection an interim cattle-dipping order was issued. The use of arsenical preparations in cattle dips is still enforced in regard to East Coast Fever infected areas, but is now (for the period of operation of the interim order) optional in respect of East Coast Fever areas.

These new dips deal effectively with the arsenic-resistant blue tick, but their general use in East Coast Fever areas is still a matter for experimentation and consequent decision later.

Staff Position.

The position regarding Government veterinary officers remains acute and extreme difficulty is being experienced in obtaining candidates to fill the vacancies.

During the period under review *eight* Government veterinary officers resigned from the Service, while it has been possible to make only *four* new appointments.

Agricultural Publications.

D. J. Seymore, B.A., Editor.

THE leeway in the publication of detailed results of research work is now being rapidly made up. The completion or the compilation of the results of many research projects had of necessity to be delayed during the war period, and only the most important findings could be announced through *Farming in South Africa*. Since last year, however, there has been a continuous flow of manuscripts, and when these appear in print, the information on the results of Departmental research will again be up to date.

During the year 15 science bulletins were submitted for publication and 11 were published, thereby bringing the scientific series up to 281. Of the popular bulletins, 20 manuscripts have been approved for publication, while 13 such bulletins have been issued, bringing the total of the series up to 284.

For the unnumbered series of bulletins, 2 manuscripts were received for publication, and 2 were printed.

Of the memoirs group of scientific publications, Part 6 of Vol. II of the Entomological Memoirs has been published during the year; of *Bothalia* two volumes are in hand, viz. Vol IV (Parts III and IV) and Vol V; and of the Botanical Memoirs, Nos. 21 and 22 are in the course of being printed.

In the Department's Press Service, which for the present is still being issued fortnightly, 97 articles were published in the 26 Press bulletins issued to the Press for dissemination. Apart from this service some 14 Departmental statements were sent telegraphically to the Press.

The Department's Monthly Journal.

Through *Farming in South Africa* 129 articles on a variety of agricultural topics were made available to the farming community. Of many of these articles reprints were made to be used in correspondence with farmers for advice on particular farming problems. The total number of subscribers to the journal has now passed the 10,000 mark, and during the year 179,200 copies of this journal were distributed, 86,600 being in Afrikaans and 92,600 in English. The cost of printing, including that of the annual report, the size of which constituted nearly 5 issues of the ordinary journal, was £9,941, of which £4,768 was for the Afrikaans and £5,173 for the English edition. The revenue from subscriptions and advertisements amounted to £2,538.

Sale of Agricultural Bulletins.

As the Publications Section is the Central Office for the storage and distribution of the Department's popular bulletins, applications for such bulletins are received from all parts of the country, as well as from neighbouring territories and even from the whole of the African continent. This year 10,871 enquiries were received, and altogether 34,052 bulletins and 5,128 reprints were despatched. The moneys collected from the sale of bulletins amounted to £1,568, of which £293 constituted subscriptions for *Farming in South Africa*. As bulletins are continually running out of stock, an amount of £167

had to be refunded as the literature applied for could not be supplied. The abovementioned figures are slightly lower than those for the previous year, when an amount of £1,694 was received for bulletins, of which 35,812 were supplied. The demand for bulletins, however, remains active, and some bulletins have already reached their sixth edition.

Agricultural Radio Service.

Besides a weekly radio talk on matters of interest to housewives, which was broadcast every Wednesday during the year, by Home Economics Officers of the Department, a radio programme lasting twenty minutes, was broadcast in collaboration with the South African Broadcasting Corporation, every Monday and Wednesday at eight o'clock.

These broadcasts are designed to furnish farmers with timely information and suggestions, with a view to building up a sound and stable agriculture. Not only are the services of officers of the Department harnessed for this purpose but, wherever possible, the collaboration of prominent farmers is also enlisted for the programmes. To encourage the participation by farmers one programme per month is devoted to replies to questions submitted by farmers.

Improvement of Farming Practices in the Union :—

[Continued from page 1027.]

associations, they are now, as in the case of extension officers, stationed at various points from which they each serve a separate community. They are now in a position, in addition to giving lectures and demonstrations at meetings, to pay visits to farms in order to give personal advice in the home, and for this purpose each was provided with a car.

Difficulty is experienced in obtaining qualified ladies to fill all the posts and consequently the areas served by the respective officers are unfortunately much too large. It is hoped, however, that the situation will improve in the course of time.

During the year, 899 lectures and demonstrations, attended by 20,124 persons, were given to women's organizations. Of this number, 181 were small meetings on different settlements with a total attendance of 1,004. In addition, the Home Economics Officers visited 1,141 families (365 on settlements), acted as judges on 271 occasions such as shows and branch competitions, and attended 45 conferences. A total of 48 radio talks were prepared as well as 28 articles for departmental publications, and 9,189 advisory letters were written to the public. Twenty-eight short courses were held, and duty was performed at seven agricultural club and land-service camps. Several cooking and other experiments were carried out in the substitution of different kinds of flour for wheat flour in confectionery and in soap making.

N.B.—The sixth revised edition of the cookery book "Foods and Cookery" has just been published and can be obtained from the Government Printer, Pretoria, at 5s. per copy.

Directorate of Meat Supplies.

H. P. Smit, Director.

Supplies of Slaughter Stock.

THE supply position remains unfavourable and unsatisfactory. From a review of the past three completed years, which has now become possible, the following interesting figures of slaughtering in the nine controlled areas, as shown in the accompanying tables, emerge. Although the principal data refer to the report years (September to August) the figures for the Organization's financial years (April to March), which are readily available, have been included in order to show that the tendencies are consistent.

TABLE I.—*Slaughtering—Nine Controlled Areas.*

Period.	Cattle.	Sheep, lambs and goats.	Pigs.	Calves.	Cattle units.
1.9.44–31.8.45.....	548,221	1,872,466	411,098	84,066	759,755
(1.4.45–31.3.46).....	578,457	1,933,974	384,522	79,027	786,871
1.9.45–31.8.46.....	630,824	1,827,287	363,878	80,479	831,895
(1.4.46–31.3.47).....	772,777	1,816,280	263,198	80,768	953,231
1.9.46–31.8.47.....	762,386	1,597,976	253,514	86,736	926,849
Quota figures on 100 per cent. consumed at 31.8.47.....	774,748	4,131,972	628,000	117,312	1,185,589

TABLE IA.—*Index of Slaughtering—Nine Controlled Areas, with Year 1 September 1944–31 August 1945 as basis.*

Period.	Cattle.	Sheep, lambs and goats.	Pigs.	Calves.	Cattle units.
1.9.44–31.8.45.....	100	100	100	100	100
(1.4.45–31.3.46).....	105.5	103.3	93.5	94	103.6
1.9.45–31.8.46.....	115.1	97.6	88.5	95.7	109.5
(1.4.46–31.3.47).....	141	97	64	96.1	125.5
1.9.46–31.8.47.....	139.1	85.3	61.7	103.2	122

TABLE IB.—*Weekly Slaughtering—Nine Controlled Areas.*

Period.	Cattle.	Sheep, lambs, and goats.	Pigs.	Calves.	Cattle units.
1.9.44–31.8.45.—					
Average.....	10,344	35,330	7,757	1,586	14,335
Lowest.....	3,747	18,556	5,633	887	8,272
Highest.....	16,206	56,933	11,057	2,385	21,118
1.9.45–31.8.46.—					
Average.....	12,131	53,140	6,998	1,548	15,998
Lowest.....	3,503	12,192	3,765	695	5,758
Highest.....	18,637	59,865	9,390	2,136	23,553
1.9.46–31.8.47.—					
Average.....	14,661	30,730	4,875	1,668	17,874
Lowest.....	10,771	12,672	2,008	635	13,308
Highest.....	18,187	40,227	6,993	2,202	22,143

Basis for conversion to cattle units:—

1 head of cattle = 15 sheep = 5 pigs = 12 calves.

From these figures it is notable that—

- (i) the numbers of cattle marketed in the controlled areas during the past 18 months showed a satisfactory increase, in round figures, from 548,000 for the year 1944-45 to 762,000 for the year 1946-47 and that marketing during the last mentioned period was much more regular. During the year 1945-46, for example, average weekly slaughterings came to 12,131, but the actual weekly figures ranged from as low a figure as 3,500 to 18,637. During the year 1946-47 the average weekly slaughterings came to 14,661, the lowest and highest weekly figures being 10,771 and 18,187 respectively, which shows a great improvement on those of the previous year. The price structure for the years 1946-47 and 1947-48 undoubtedly contributed to this improvement.
- (ii) sheep, lambs and goats still show a downward tendency. The difference between the 1,872,000 head marketed during the year 1944-45 (which itself was poor) and the 1,598,000 head marketed during the year 1946-47 comes to 274,000, a decrease of 14.6 per cent. The controlled areas at present receive less than 40 per cent. of their mutton requirements and prospects for an early improvement are not good. It will be a considerable time before the demand for mutton will again be satisfied. With a shortfall of more than 60 per cent., consumers who constantly clamour for mutton are expecting an impossibility, and the sooner this fact is realised and accepted, the better it will be for the nation as a whole.
- (iii) there has been a huge decline in the numbers of pigs—from 411,000 during the year 1944-45 to 253,500 for the year 1946-47, i.e. a decrease of 38.32 per cent. During the year 1946-47 the controlled areas received only 40 per cent. of their pork requirements. This strong decline in pork production was the inevitable result of the drastic economising on stock feeds which became necessary during the period March, 1945, to January, 1947. Maize products became freely available for stock-feeding purposes only in February, 1947; consequently significant improvement in the slaughter-pig position cannot be expected before the second quarter of 1948;
- (iv) the supply of calves remained fairly steady throughout, although it was never able to satisfy the demand for veal;
- (v) during the 12 months ending on 31 August, 1947, the controlled areas received the following percentages of their present quota figures (which represent a saturated demand):—

TABLE II.—*Percentages of Present Quota Figures.*

	<i>Per cent.</i>
Cattle.....	98.4
Sheep, lambs and goats.....	38.67
Pigs.....	40.37
Calves.....	73.94
Collectively.....	78

MEAT SUPPLIES.

Experience has shown that, although the quotas for the other centres have been fixed with a reasonable degree of accuracy the present saturation quotas for the Witwatersrand and Cape Town have been fixed at a figure approximately 20 per cent. too high. Allowing for this inaccuracy, the slaughtering of all types of slaughter stock for the period 1 September 1946 to 31 August 1947, numerically very closely approximate 91 per cent. of actual requirements.

Table No. IIA shows in units of 1,000,000 lb. the quantities of the various types of meat purchased by the Organization during the respective completed years since 1945, as against the present total quota for the nine controlled areas:—

TABLE IIA.—Meat Purchases as Against Full Quotas, in Units of 1,000,000 lb.

Period.	PURCHASES.				Quota (all areas) on 31.8.47.	Purchases for period 1.9.46 to 31.8.47 as percentage of total quota.
	1.4.45- 31.3.46.	1.9.45- 31.8.46.	1.4.46- 31.3.47.	1.9.46- 31.8.47.		
Beef.....	300.5	316	374.9	369.5	375.8	98.3
Mutton.....	49.2	48.6	44.3	33.9	132.2	40.6
Lamb.....	11.5	10.8	15.9	18.8		
Goat.....	1.6	1.2	.9	1		
Veal.....	4	4	4.1	4.3	5.9	72.9
Pork.....	40.9	36.4	27.3	27.5	68.6	40.01
TOTAL.....	407.3	417	467.4	455	582.5	78.1

Generally speaking, the result is the same as that shown by the slaughter figures (see Table II). After adjusting the quota figures for Cape Town and the Witwatersrand by reducing them by 20 per cent., the total quota for all classes of meat aggregates 508.3 million lb., the purchases for the year 1 September 1946 to 31 August 1947 totalling 89.5 per cent. of this figure;

- (vi) in contrast to the supply of cattle, supplies of sheep, lambs and goats, pigs and calves remained irregular as in the past. In the case of sheep, lambs and goats, the weekly supplies for the year 1946-47 varied from 12,672 to 46,227, in the case of pigs from 2,000 to 7,000 and in the case of calves from 635 to 2,202. In terms of cattle units the average weekly slaughtering amounted to 17,874, the lowest being 13,308 and the highest 22,143 which represents a great improvement on the previous year during which the weekly average came to 15,998 with a minimum of 5,758 and a maximum of 23,553. Nonetheless the position is still very unsatisfactory.

Not only the total supply, but also the supply between centres is irregular to such an extent that at the very time when certain centres were receiving more slaughter stock than could be handled and consumed, others were left practically without supplies. In the previous annual report, attention was drawn to this fact and it is only necessary to add here, by way of example, that for the months of April to August, 1947, this irregularity was responsible for the movement of 10,600 beef carcasses and 11,500 mutton carcasses to Durban and 7,330 beef carcasses to Port Elizabeth from other centres.

Walvis Bay Slaughterings.

As in 1945, the facilities of the Meat Scheme were made available for the farmers of South-West Africa at Walvis Bay during 1946.

Slaughtering was undertaken during the months of May to September, 1946, a total of 10,060 head of cattle being slaughtered. The beef was kept in cold storage at Walvis Bay and transported to the Union during the months of January to April, 1947.

The scheme was not put into operation during 1947.

The Walvis Bay slaughterings were not included in the above tables but figure in the data on cold storage supplies and meat issues.

Cold-Storage Supplies.

Cold-storage supplies for the year 1945 reached a peak in August when stocks amounted to the equivalent of 46,000 beef units. These stocks were used during the period September, 1945, to February, 1946, when they were exhausted. From March, 1946, onward new supplies were put in cold storage, but stocks were increased at a much lower rate and much more gradually than during the previous year, the peak being reached only in October to November, 1946, when there were between 48,000 and 49,000 beef units in stock. Issues became necessary only from the end of November, and stocks were not exhausted before early April, 1947.

In contrast with previous years, supplies of slaughter stock at certain centres, especially Cape Town, Durban and Port Elizabeth, were so poor that stocks which would otherwise have been stored (mainly on the Witwatersrand and at Kimberley) had to be utilized for immediate consumption. Between March and the end of August, 24,990 beef carcasses and 20,550 mutton carcasses were transferred from these two centres, chiefly to Cape Town, Port Elizabeth and Durban. Consequently, storing of stocks became possible only towards the end of July, 1947, four months later than in previous years. At the end of August, 1947, there were only 7,761 beef units in cold storage as against 36,542 beef units at the end of August, 1946, and 45,723 beef units at the end of August, 1945. Since cold-storage stocks amounted to 36,542 beef units as at 1 September, 1946 and 7,761 beef units as at 31 August, 1947, it follows that, *in addition to meat derived from slaughterings during the year 1 September, 1946 to 31 August, 1947* and meat obtained from Rhodesia (2,412 carcasses), 28,781 beef units were made available out of cold-storage stocks for consumption; in other words, more meat was issued than was produced by current slaughterings during the year, and except for the 7,761 beef units in cold-storage as at 31 August, 1947, the Directorate issued for consumption all the meat at its disposal in the course of the year.

MEAT SUPPLIES.

In this regard the position is as follows:—

TABLE III.—Meat Supplies Available and Issued.

	Beef- carcasses.	Sheep, lamb and goat carcasses	Pork carcasses.	Veal carcasses.
Frozen stocks as at 1.9.46.....	35,966	4,663	1,320	23
Frozen stocks as at 31.8.47.....	7,760	—	4	—
Frozen stocks issued for consumption.....	28,206	4,663	1,316	23
Adjustment in regard to differences between (a) current stocks as at 1.9.46 and 31.8.47 and (b) stocks in transit on 1.9.46 and 31.8.47	—662	—631	+124	+273
TOTAL.....	27,544	4,032	1,440	296
Purchased from Rhodesia.....	2,412	—	—	—
Obtained from slaughtering (after deduc- tion of condemned carcasses)	750,492	1,596,796	243,758	85,712
Available for issue, and actually issued...	780,448	1,600,828	245,198	86,008

Distribution of Meat.

The Directorate in the first place aims at distributing the available meat supplies as equitably as possible among the nine controlled

TABLE IV.—Movement of Stocks—Period 1 September 1946 to 31 August 1947.

Centre.	Beef (carcasses).				Mutton (carcasses)			
	Des- patches.	Time.	Receipts.	Time.	Des- patches.	Time.	Receipts.	Time.
Witwatersrand.....	32,414	Whole year.	1,420*	Whole year.	8,571	Mar./ May.	—	—
Kimberley.....	7,593	Whole year.	—	—	12,815	Whole year.	—	—
Port Elizabeth.....	—	—	11,606	Jan./ Aug.	—	—	1,291	Apr./ Jun.
Durban.....	1,388†	Jan./ Feb.	12,110	Mar./ Aug.	—	—	16,386	Mar./ Jul.
Pretoria.....	701*	Mar./ Jul.	12,879	Sep./ Feb.	—	—	5,758	Mar./ Aug.
			1,694	Jun./ Aug.				
Cape Town.....	3,224	Jun./ Aug.	19,483	Feb. May.	—	—	10,559	Feb./ May.
Pietermaritzburg.....	974	Jan./ Mar.	1,502	Apr./ Aug.	736	Mar.	639	Aug.
East London.....	165	Sep. 1946.	1,031	Mar./ Apr.	3,676	May./ Jun.		
	3,744	Jan./ Feb.	288	Jul./ Aug.	—	—	—	—
	615	May/ Jun.						
Bloemfontein.....	508	Sep. 1946	300	Jul./ Aug.	8,828	Feb./ May.	—	—
	369	Jan./ May.	—	—	—	—	—	—

* Mainly inferior carcasses for compounds use.

† Old stocks of treated measly carcasses.

areas. From Table V it will be seen that the Organization achieved a considerable measure of success in this respect: Aggregate issues by the nine centres during the year, for normal trade purposes, came to 83.7 per cent. of the quota, the greatest divergence (in the case of Port Elizabeth) being 12.8 per cent. In order to achieve such successful distribution of the available meat supplies among the nine areas, it was necessary to move more than 52,000 beef carcasses and more than 34,626 mutton carcasses by rail and road between centres during the 12 months. The incidental cost was high, amounting to £59,681 in rail and road transport, £9,829 in re-inspection fees and £9,519 in handling, loading and refrigeration—a total of £79,029.

The position in regard to movement of stocks is set out in table IV.

From this table it appears that the areas fall into three main groups:—

- (a) those like Kimberley and the Witwatersrand which were able to, and had to, help the other centres throughout the year;
- (b) those like Port Elizabeth, Pretoria and Durban which had to receive help from other centres practically throughout the year;
- (d) those like Cape Town, Pietermaritzburg, East London and Bloemfontein which were able to place stocks at the disposal of other centres during certain months but were dependent on other centres for the rest of the year.

Table V gives details of the ordinary trade quotas*, the actual meat issues for normal trade purposes and the population figures for the nine controlled areas individually and collectively.

TABLE V.—*Ordinary Trade Quotas and Issues—Period 1 Sept. '46 to 31 Aug. '47.*

Area.	Quota in total pounds.	Issues in total pounds.	Per- centage of quota.	Popula- tion.	Meat avail- able per individual.	
					Pounds per year.	Ounces per day.
Bloemfontein.....	11,135,740	9,160,639	82.3	82,846	110.7	4.9
Cape Town.....	71,490,704	65,482,979	91.5	486,078	134.6	5.9
Durban.....	45,994,368	35,446,650	77.1	401,672	88.2	3.9
East London.....	13,500,990	9,875,315	73.1	78,819	125.3	5.5
Kimberley.....	9,489,583	7,767,390	81.9	55,545	139.8	6.1
Pietermaritzburg.....	8,108,010	6,507,923	80.3	79,040	82.3	3.6
Port Elizabeth.....	25,824,358	18,060,237	69.9	152,039	118.8	5.2
Pretoria.....	41,899,004	32,350,219	77.2	265,929	121.6	5.3
Witwatersrand.....	222,581,248	192,068,798	86.3	1,497,265	128.3	5.6
TOTAL.....	450,024,005	376,740,150	83.7	3,099,833	121.5	5.3

(N.B.—In this table the quota for Cape Town and the Witwatersrand which, has already been pointed out, was fixed at too a high a figure, was corrected by reducing the figures by 20 per cent.)

The low individual figures of 3.9 ozs. and 3.6 ozs. in the case of Durban and Pietermaritzburg respectively are explained by the fact that throughout the year there was little mutton available at these centres, which carry a relatively large Indian population of non-consumers of beef. The following are the population figures for these two areas:—

	Europeans.	Asiatics.	Coloureds.	Natives.	Total.
Durban.....	132,675	131,763	10,977	126,258	401,673
Pietermaritzburg.....	29,320	14,447	3,575	31,698	79,040

* See note at the end of page 1171.

MEAT SUPPLIES.

The total quantity of meat issued against ordinary trade quotas during the 12 months 1 September, 1946, to 31 August, 1947, and in that way made available for general consumption, comes to 376,740,150 lb. The collective population of the nine areas, according to the census figures of 1946, was 3,099,833. For every man, woman and child of all races and classes, therefore, a total amount of 121·5 lb. of meat in one form or another was made available during the year in the controlled areas, i.e. an average of 5·3 ozs. per person per day.

If the edible offal (from 70 to 80 lb. per head in the case of cattle and from 5 to 6 lb. per sheep) is included, the figure of 5·3 ozs. per person per day must be increased by approximately $\frac{1}{8}$ to a figure of roughly 6·2 ozs.

Although the Directorate undoubtedly achieved a high measure of success in effecting a fairly equitable distribution of the available supplies among the nine areas during the 12 months 1 September, 1946 to 31 August, 1947, it was unable, despite its most concentrated efforts, to repeat the success in regard to even distribution from week to week during the year; the irregular arrival and the unbalanced nature of supplies of slaughter stock arriving at the various centres were too great. Movement of meat stocks require time, and in order to reduce costs to a minimum and to prevent the movement of meat to a centre not requiring it, issues must necessarily be delayed to the last moment with a view to ascertaining what supplies of slaughter stock will actually be available at each centre. Consequently, if the position at any particular centre suddenly deteriorates as a result of the non-arrival of a portion of the expected supplies of slaughter stock, stocks despatched from other centres sometimes fail to arrive in time to fill the gap immediately. In such a case the issue percentage generally shows a sudden and serious decline. The average percentage issues for the various centres over the year, together with the maximum and minimum percentages, are given in the following table:—

TABLE VI.—*Percentage Issues for Ordinary Trade.*
(Period 1 September 1946 to 31 August 1947).

Area.	Weighted average for year.	Maximum.	Minimum.	Number of weeks during which percentage issues fell below:—	
				50	60
*Witwatersrand.....	86·3	109·5	56·4	—	2
*Cape Town.....	91·5	140·4	62·6	—	—
Durban.....	77·1	136	40·6	2	6
Pretoria.....	77·2	94·7	52·5	—	3
Port Elizabeth.....	69·9	102·8	49·6	1	3
East London.....	73·1	93·5	44·5	1	4
Bloemfontein.....	82·3	112	45	1	6
Kimberley.....	81·9	103	69·6	—	—
Pietermaritzburg.....	80·3	120	49·3	1	4

* The figures for the Witwatersrand and Cape Town have been adjusted by reducing the quotas by 20 per cent.

Extremely low issues were therefore the exception and the Directorate is intensifying its efforts at preventing undue fluctuations in the weekly issues.

Analysis of Meat Purchases.

Table VII contains an analysis of the meat purchases effected by the Directorate from the date of its inception to 31 March, 1947.

TABLE VII.

ANALYSIS OF PURCHASES.

BEEF.

Period.	15.5.1944.-31.3.1945.					1.1.1945.-31.3.1946.					1.1.1946.-31.3.1947.				
	Average weight per carcass.	Average value per 100 lbs.	Percentage of total carcasses.	Percentage of total weight.	Average weight per carcass.	Average value per 100 lbs.	Percentage of total carcasses.	Percentage of total weight.	Average weight per carcass.	Average value per 100 lbs.	Percentage of total carcasses.	Percentage of total weight.	Average weight per carcass.	Average value per 100 lbs.	Percentage of total carcasses.
Refrigeration.....	NIL.		NIL.	NIL.	NIL.		NIL.	NIL.	NIL.		NIL.	NIL.	NIL.		NIL.
Super.....	665.9		0.8	1.0	666.7	75.2	0.4	0.5	755.6	101.0	—	0.1	831.9	73.6	0.2
Prime.....	644.9		8.6	10.5	663.8	64.9	6.0	7.7	649.6	64.3	4.0	8.5	649.6	64.3	4.0
Grade I.....	595.3		30.3	31.4	602.3	49.4	23.9	27.8	538.5	55.6	17.9	31.7	497.8	48.7	39.4
Grade II.....	518.2		32.2	31.4	518.6	49.4	36.4	36.3	437.8	48.7	39.4	40.4	404.8	42.4	31.9
Grade III.....	444.9		20.5	17.3	435.1	42.8	26.2	22.0	324.6	27.11	8.4	8.8	324.6	27.11	8.4
Grade IV.....	366.4		4.3	2.9	362.2	29.2	3.8	2.6	438.0	46.4	2.5	2.5	438.0	46.4	2.5
Detained.....	540.0		2.8	2.9	517.7	40.1	2.6	2.5	438.0	46.4	2.5	2.5	438.0	46.4	2.5
Condemned.....	477.9		0.5	0.5	470.5	43.4	0.7	0.6	434.8	39.3	0.7	0.6	434.8	39.3	0.6
All Grades.....	529.2		—	—	519.5	50.7	—	—	435.1	48.10	—	—	435.1	48.10	—
Total weight.....	323,216,704				300,483,148				374,909,963				374,909,963		
Total Number of Carcasses	421,806				578,485				772,777				772,777		

VEAL.

	per lb.	100	100	per lb.	Gr. I 52.8 Gr. II 46.8	8.1 6	68.5 36.5	68.8 33.7	59.5 46.0	8 6	33.5 68.5	59.5 46.0	8 6	33.5 68.5	59.5 46.0
45.4															
45.4															
2,460,064															
76,286															
Total weight.....															
Total Number of Carcasses															

* Reliable statistics regarding prices for this period are not available.

TABLE VII.—(Continued.)

MUTTON.

Period.	15.5.1944-31.3.1945.				1.4.1945-31.3.1946.				1.4.1946-31.3.1947.			
	Grade.	Average weight per carcass.	Average value per 100 lbs.	Percentage of total carcasses.	Percentage of total weight.	Average weight per carcass.	Average value per lb.	Percentage of total carcasses.	Average weight per carcass.	Average value per lb.	Percentage of total carcasses.	Percentage of total weight.
	Super.....	47.4	*	4.8	6.3	47.8	d. 10.5	2.3	49.6	d. 10.7	3.7	5.1
	Prime.....	40.3		34.9	39.1	38.9	9.6	27.8	40.5	9.7	33.9	38.8
	Grade I.....	33.8		47.3	44.4	31.9	8.9	56.4	32.8	8.9	49.8	46.2
	Grade II.....	28.3		13.0	10.2	27.3	6.8	13.5	27.7	6.9	12.6	9.9
	All Grades.....	36		—	—	33.6	8.9	—	35.4	9.1	—	—
	Total weight.....	35,323,094				49,186,157			44,308,104			
	Total Number of Carcasses.....	979,253				1,466,011			1,251,727			

LAMB.

Super.....	35.3	4.5	5.6	35.6	12.0	2.6	3.4	37.5	12.1	1.8	2.3
Prime.....	30.1	36.8	38.8	29.3	11.0	30.4	33.1	30.9	11.1	40.1	42.4
Grade I.....	27.1	58.7	55.6	25.5	10.3	67.0	63.5	27.8	10.3	58.1	55.3
All Grades.....	28.6	—	—	26.9	10.6	—	—	29.3	10.7	—	—
Total Number of Carcasses.....	311,400			428,383				542,183			
Total weight.....	8,903,825			11,514,980				15,362,716			

GOATS MEAT.

Grade I.....	44.9	66.4	70.4	44.0	7.5	61.5	67.6	45.8	7.6	51.7	59.3
Grade II.....	37.3	38.6	29.6	33.6	6.0	38.5	32.4	33.6	6.0	48.3	40.7
All Grades.....	42.4	—	—	40.0	7.0	—	—	39.9	7.0	—	—
Total weight.....	1,863,450			1,583,849				891,883			
Total Number of Carcasses.....	43,734			39,620				22,370			

* Reliable statistics regarding prices for this period are not available.

PORK.
SUCKLING PIGS.

TABLE VII.—(Continued.)

Period.	15.5.1944-31.3.1945.				1.4.1945-31.3.1946.				1.4.1946-31.3.1947.			
	Grade.	Average weight per carcass.	Average value per 100 lbs.	Percentage of total carcasses.	Percentage of total weight.	Average weight per carcass.	Average value per lb.	Percentage of total carcasses.	Percentage of total weight.	Average weight per carcass.	Average value per lb.	Percentage of total carcasses.
Total weight.....	15.4	*		—	—	14.6	^d 15.2	—	—	14.9	^d 15.25	—
	75,089					46,188				32,282		
	4,845					3,151				2,188		
BACONERS.												
Grade I.....	155.4			16.9	23.5	153.9	11.7	15.3	21.9	152.6	13.3	17.4
	138.5			10.8	14.7	152.7	10.0	9.7	13.7	149.4	10.8	7.9
	154.5			27.7	38.2	153.3	10.8	25.0	35.6	151.6	12.6	25.3
PORKERS.												
Grade I.....	65.6			24.0	14.1	65.8	11.3	20.2	12.4	67.5	11.25	23.2
	77.4			28.4	18.3	72.0	10.0	27.1	18.3	73.8	10	26.7
	71.5			50.4	32.3	68.9	10.6	47.3	30.7	70.6	10.6	49.9
OTHER PIGS.												
Suckling pigs.....	202.1			9.7	17.6	169.2	9.1	14.1	22.2	174.9	9	11.25
	110.6			8.7	0	80.9	7.7	19.1	8.5	80.3	7.75	9.8
	91.9			2.9	2.4	89.4	5.2	3.0	2.5	89.0	6.0	2.9
Baconers pigs.....	106.4			0.6	0.5	101.9	9.0	0.5	0.5	99.1	3.5	0.4
											9.1	0.6
												0.6
All other pigs.....	152.3			21.9	29.5	180.8	8.5	27.7	33.7	123.8	8.4	24.8
												20.4
All pigs excluding suckling pigs.....	112.3			—	—	107.3	10.0	—	—	104.5	10.7	—
	39,710,421					40,914,549				27,277,953		
	253,531					331,371				261,010		

* Reliable statistics regarding prices for this period are not available.

MEAT SUPPLIES.

The figures are of especial importance in so far as they reflect the quality and the average weights of the different kinds of slaughter stock. It will be noticed that the average weight and the quality as reflected by the grading of all kinds of slaughter stock, excluding cattle and pigs, remained fairly steady throughout the entire period. In the case of pigs the grading also remained fairly steady during a period of years, but the average weight of pigs marketed fell from 112·3 lb. in 1944-45 to 107·3 lb. in 1945-46 and 104·5 in 1946-47. Since baconers and porkers are graded according to weight, it follows that the average weight of these types of pigs should have remained constant which actually was the case. The greatest fall in average weights occurred in the case of sausage pigs which fell from 202 lb. to 175 lb. and of larders which fell from 120 lb. to 80 lb. It would appear that collection dealers during the years 1945-46 and 1946-47 marketed relatively larger numbers of kaffir pigs, which are comparatively light, than during the period 1944-45. This may account for the fall in weight.

The changes recorded in respect of cattle are really disturbing and reflect a very unsound situation. The average weight of cattle slaughtered in the controlled areas fell from 529 lb. in 1944-45 to 519·5 lb. in 1945-46 and 485·1 lb. in 1946-47—a fall of 8·34 per cent., as compared with the figures for the first year. In itself this change is serious enough, but it gains in significance if regard is had to the steady deterioration in quality which is clearly borne out by the data. The following table gives a comprehensive review of the position:—

TABLE VIII.—*Grading of Beef Carcases by Numbers and by Weight.*

	15.5.44— 31.3.45.		1.4.45— 31.3.46.		1.4.46— 31.3.47.	
	% by numbers.	% by weight.	% by numbers.	% by weight.	% by numbers.	% by weight.
Grade I and higher	39·7	45·1	30·3	36	22·1	27·6
Grade II (medium quality).....	31·4	31·4	36·4	36·3	39·4	40·4
Grade III and lower.....	24·8	20·1	30	24·6	35·3	28·9

This deterioration in quality and average weight has not run its full course yet, as appears from the following comparative statement of grading and weights compiled from the most recent available data, i.e. those for the quarter 1 April, 1947 to 30 June, 1947. For direct comparison with the same quarter of the preceding years, the figures for the latter are also included.

NOTE.—The term “ordinary trade quotas” has reference to the collective quota of all traders for their ordinary trade, that is after deduction of preference quotas for hospitals, etc., and non-preference quotas for compound contracts, etc., and the term “issued for ordinary trade purposes” to the amount of meat issued against the ordinary trade quotas and therefore made available to the general public.

TABLE IX.—*Grading and Weights—Cattle.*

	1.4.45-30.6.45.			1.4.46-30.6.46.			1.4.47-30.6.47.		
	% by numbers.	% by weight.	Average weight.	% by numbers.	% by weight.	Average weight.	% by numbers.	% by weight.	Average weight.
S.....	.3	.4	662.4	.1	.1	687.8	.2	.2	659.3
P.....	5.9	7.3	658.8	3.1	4	655.5	3.9	5.3	617.7
I.....	25.8	29.5	604.6	19.1	22.7	589.9	17.5	20.9	544.6
II.....	37.1	36.9	527.4	43	43.7	503.1	39.4	40.4	468.6
III.....	23.4	19.8	447.6	28.2	24	423.5	32.1	27.1	387.5
IV.....	4.2	2.9	363.4	3.2	2.3	345.4	3.2	2.2	317.6
Retained.....	2.6	2.6	531.8	2.4	2.3	488.8	2.6	2.8	477.9
Rejected.....	.7	.6	471.9	.9	.9	474.8	.6	.6	409
Average	529.7			496.4			457.1		
Number.....	173,800			207,483			183,522		
Weight (lbs.)	92,056,427			103,000,903			83,948,428		

The following simplified table (Table X) is added with a view to making the figures of Table IX more comprehensive.

TABLE X.—*Grading—Cattle.*

	1.4.45-30.6.45.		1.4.46-30.6.46.		1.4.47-30.6.47.	
	% by numbers.	% by weight.	% by numbers.	% by weight.	% by numbers.	% by weight.
Grade I and higher.....	32	37.2	22.3	26.8	21.6	26.4
Grade II (medium quality).....	37.1	36.9	43	43.7	39.4	40.4
Grade III and lower.....	27.6	22.7	31.4	26.3	35.3	29.3

These figures speak for themselves and it is no wonder that housewives are constantly complaining of the steady deterioration in the quality of beef sold to them. Nothing else can be expected when, at the utmost, only 25 per cent. of the animals slaughtered in the controlled areas are of superior quality.

It is also significant that the average weight of cattle which, during the second quarter of 1945 was 529.7 lb., fell to 496.4 lb. (a decrease of 6.3 per cent.), during the second quarter of 1946 and to 457.1 lb. (a decrease of 13.7 per cent.) during the second quarter of 1947. The decrease in average weight from 496.4 lb. in the second quarter of 1946 to 457.1 lb. in the second quarter of 1947 reflects a fall of almost 8 per cent. During the second quarter of 1947 slaughtering of cattle totalled to 183,522 as against 173,800 during the second quarter of 1945 (an increase of 5.59 per cent.) but the larger number of animals yielded 8.81 per cent. less meat, i.e. 83.9 million lb. as against 92 million lb.

MEAT SUPPLIES.

This can be explained only in one of two ways: Either the quality and weight of slaughter cattle in the Union shows great deterioration over the past three years on account of unfavourable climatic conditions, or cattle of the best quality and weight (these are inseparable) are bought up by butchers outside the controlled areas who, in the first place, are out to increase their turnover by buying up heavy animals, in spite of the restrictions imposed upon their slaughter quota, and in the second place are free to pay higher prices than those fixed for the controlled areas. The truth is probably that a combination of these two factors is responsible.

Offal.

In regard to offal, the position remains unchanged except that in February, 1947, a private offal contractor was appointed at Pietermaritzburg to buy offal at prices similar to those fixed for Durban.

Revision of Price Structure.

The price structure between producer and consumer was revised in June, 1947, and corrected in terms of the findings and recommendations of the reconstituted Meat Trade Costs Committee which had completed a very thorough investigation of all aspects of this matter. Minor modifications were effected in the method of cutting up carcasses for determining the retail prices of the various cuts and joints, and the trade margins and allowances for shrinkage and wastage were brought into line with the findings of the Committee.

The weighted average margins and allowances to the trade in respect of all classes and grades of meat before and after these adjustments are given in *pence per lb.* below: —

	29 October, 1945 to 7 June, 1947.	After 7 June, 1947.
Allowance for shrinkage.....	·2719	·2232
Wholesale margin.....	·36	·347
Retail margin.....	1·3625	1·573
Allowance for wastage.....	·2719	·3946
TOTAL.....	2·2663	2·5378

The new price structure provides—

- (a) in the case of retailers who obtain their supplies direct from the Directorate, for a weighted average margin of 21s. 2d. per 100 lb. meat handled by them, in respect of shrinkage, wastage and operational costs and profit; this represents an increase of 2s. 5d. over the previous margin;
- (b) in the case of retailers who purchase their supplies from wholesalers as *chilled meat*, for a weighted average margin of 16s. 5d. per 100 lb. meat handled by them, in respect of wastage, operational costs and profit; this represents an increase of 2s. 11d. over the previous allowance.

The clear trade margin, i.e. for profit and operational costs (shrinkage and wastage excluded) was fixed at 16s. per 100 lb. and allocated as follows:—

	On Beef (average on all grades). (per 100 lb.)	On other meat.
(a) Increased allowances for shrinkage.....	s. d. 6	d. 06
(b) To wholesalers.....	2 10	375
(c) To retailers.....	13 2	1.545
TOTAL.....	16 6	1.98 or 16s. 9d. per 100 lbs.

The allowance under (a) is intended to reimburse the seller (the Directorate or wholesaler) in respect of the cold-storage costs necessarily incurred in chilling the meat. The allowance for shrinkage covers only the value of the weight lost by the meat during the process of chilling and not the inevitable cold-storage costs.

The following are examples of the method employed in calculating the price spread between producer and consumer. The figures have reference to the Witwatersrand:—

	Beef Grade 1 per 100 lb.	Mutton Grade 1 per lb.	Pork Grade 1 per lb.
Producer's price (In the case of beef, the lowest price for the season).....	s. d. 49 0	d. 10	d. 12.25
Average cost of seasonal premium.....	7 5	—	—
Average purchase price.....	56 5	10	12.25
*Margin for the Directorate.....	3 3	.25	.25
Wholesaler's purchase price (Warm weight).....	59 8	10.25	12.25
Allowance for shrinkage (2.3% plus 6d. per 100 lb.)....	1 11	.3125	.375
Wholesaler's purchase price (Cold weight).....	61 7	10.5625	12.875
†Wholesaler's margin.....	2 11	.375	.375
Retailer's purchase price (Cold weight).....	64 6	10.9375	13.25
†Retailer's margin (In the case of retailers buying from wholesalers).....	14	1.545	1.545
Retailer's purchase price plus margin.....	78 6	12.4825	14.795
Allowance for wastage (4.17%).....	3 3	.5305	.617
Retailer's selling price (Whole carcass).....	81 9	13.003	15.412

* The margin for the Directorate varies from grade to grade and from class to class, averaging 2s. per 100 lb. meat.

† The wholesaler's and retailer's margins vary from grade to grade in the case of beef, averaging, as already indicated, 2s. 10d. and 1s. 2d. per 100 lb. respectively

MEAT SUPPLIES.

The next step is to convert the retail selling price for entire carcasses to prices for the individual cuts and joints. This is done by determining the ratios, by weight and quality, of the various cuts and joints to the carcass as a whole and then calculating the prices in such a manner as to enable the retail butcher to recover the average price for the entire carcass upon selling all the cuts and joints of the carcass at the fixed prices. In the case of mutton, Grade I, on the Witwatersrand, in respect of which the retail selling price shown above amounts to 13·003d. per lb. for an entire carcass, the retail prices were fixed as follows:—

Cut.	Percentage ratio to whole carcass by weight.	Clear price per lb.	Published price per lb.	Total realizations per 100 lb.
	%	d.	d.	d.
A. Entire forequarter.....	38·9301	10	10	389·301
Entire hindquarter.....	61·0699	14·917	15✓	910·999
Entire carcass.....	100	13·003	13	1,300·3
B. Entire front.....	49·291	10·949	11	539·665
Entire back.....	50·709	15	15	760·635
Entire carcass.....	100	13·003	13	1,300·3
C. Tail fat.....	·7592	13	13	9·8696
Leg.....	27·666	14·997	15	414·9285
Loin (without flank).....	21·6807	17	17	368·5719
Kidneys.....	·6886	3d. each	—	18 (a)
Suet.....	3·125	9	9	28·125
Flank.....	7·1504	10	10	71·504
Breast with shank.....	17·9732	10	10	179·732
Thickrib.....	13·6123	11·613	12	158·0831
Neck.....	6·1441	6	6	36·8646
Scraps—				
usable.....	·1412	6	—	·8472
unusable.....	1·0593 (b)	13·003	—	13·7741
	100	13·003	13	1,300·3

(a) Since the final realization is expressed per 100 lb., the realization of kidneys must be calculated on three carcasses with an aggregate weight of approximately 100 lb. Kidneys are priced at 3d. each, consequently the six kidneys from three carcasses realize 18d.

(b) Unusable scraps must be listed at the average price of the carcass in view of the general allowance made for this type of loss.

In the case of a few cuts like chops and cutlets and shoulder, which form part of larger priced cuts but which nevertheless are sold in the trade as separate cuts, proportionate retail prices have been fixed. The price of first grade mutton cutlets, for example, has been fixed for the Witwatersrand at 18d. per lb. as against the price of 17d. per lb. for the entire loin and the price of shoulder at 11d. per lb. as against 10d. per lb. for the entire breast with shank.

The trade margins and allowances and the retail prices for cuts are calculated on exactly the same basis for every controlled area and for every individual grade of meat.

The forgoing adjustments in the price structure were effected when the consumer's prices were brought into line with the new producer's prices announced during April, 1947. It is common

knowledge now that the producers' prices for mutton, lamb, goat and pork were raised by amounts varying from $\frac{1}{4}$ d. to $1\frac{1}{4}$ d. per lb. with a view to drawing larger supplies of these types of slaughter stock to the controlled markets.

These increases in the producers' prices, together with the adjustments, led to the following changes in retail prices in the various controlled areas:—

- (a) Beef from .02d. to .46d. per lb.
- (b) Mutton from .9375d. to 1.6875d. per lb.
- (c) Lamb from .6875d. to 1.6875d. per lb.
- (d) Goat from .25d. to 1.625d. per lb.
- (e) Pork from .5d. to 1.1875d. per lb.

These increases in the average consumer's prices were added mainly to the prices of the best cuts and joints, for two reasons: First, to prevent any rise in the prices of the medium and inferior cuts which are generally bought by the poorer classes of the population and, second, to avoid increasing the prices of individual cuts by fractions of a penny.

Farming Problems in the Winter-Rainfall Area:—

[Continued from page 1137.]

Dairying.

In this division too, there is only one officer, viz. the assistant professional officer and he could cope only with lectures and keep the dairy going with the assistance of unskilled labourers.

Agricultural Economics.

The two economists have to devote all their time to lectures, consequently practically no investigations could be made into the many economic problems of the winter-rainfall area. Basic research in connection with agricultural economics requires field work which cannot be undertaken by lecturers who have to give daily lectures.

By means of a farm bookkeeping system a study is being made in collaboration with the Division of Economics and Markets, of the running costs of wine farming. The results of the first year are at present being elaborated and analysed. Further, the Division is also occupied with research work from secondary data, viz., the collection and analysis of price ranges of agricultural products.

Dehydration and Cold Storage of Food Products:—

[Continued from page 1155.]

Protein from stickwater.—A method was developed for the recovery of protein from fish liver stickwater for incorporation in cattle fodder. The process is based on the coagulation of the protein by heat at a controlled pH value, whereby a 54 per cent. recovery was effected.

Cold Storage Inspection.

Due to shortage of staff and to other urgent work, cold storage work was confined to routine inspection of cold storage plants. Several cold storages were visited on request and advice was furnished.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26

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Price Review for October, 1947.*

Fruit.—All the markets were well supplied with cold storage apples, but the supply of oranges decreased. The first quantities of cherries and apricots of the season experienced a strong demand and high prices were obtained. Reasonable supplies of tropical fruit reached the markets. The prices of avocados increased from 5s. 6d. to 6s. per tray on the Cape Town market, and from 5s. 5d. to 5s. 11d. per tray (National Mark) on the Johannesburg market.

Tomatoes.—Supplies of tomatoes of inferior quality increased on nearly all the markets, and prices decreased from 7s. 2d. to 5s. per tray (National Mark No. 1) and from 3s. 9d. to 1s. 10d. per tray for others on the Johannesburg market; from 4s. 1d. to 2s. 8d. on the Cape Town market; and from 1s. 3d. to 1s. 2d. on the Durban market.

Onions.—Supplies from the Transvaal increased on all the markets. Prices were on a lower level and decreased on the Johannesburg market from 43s. 1d. to 27s. per bag for Transvaal onions, and from 50s. 10d. to 45s. 3d. per bag for Cape onions.

Potatoes.—Large supplies of Transvaal summer potatoes still arrived on the markets. Supplies of fresh potatoes from the Transvaal Lowveld became available. Prices particularly for the better grades, increased on most markets, e.g. from 17s. 6d. to 22s. 3d. per bag for Grade 1 on the Johannesburg market.

Vegetables.—All the markets were very well supplied. The prices of green beans decreased from 3s. 9d. to 2s. 9d. per pocket on the Johannesburg market, and from 5s. 4d. to 2s. 6d. on the Cape Town market.

* All prices mentioned are averages.

Seeds, Grains and Feedstuffs.—Teff hay supplies were still of inferior quality, and on the Johannesburg market prices decreased from 4s. 10d. to 4s. 7d. per bale. Lucerne-hay prices remained firm on the Cape Town market, but on the Johannesburg market prices decreased from 7s. 5d. to 5s. 11d. per bale.

Eggs and Poultry.—The markets were well supplied. The prices of Grade I large eggs remained firm on the Johannesburg market, but increased from 1s. 8d. to 1s. 10d. on the Durban market. The prices of fowls were on a lower level.

Prices of Wheat and other Winter Cereals for the Season, 1947/48.

Wheat.—As announced by the Government in a press statement issued on 9 May 1947, the producers' price of wheat (i.e. basic price plus subsidy) was increased by 6d. per bag for class B grade I for the season 1947-48, with corresponding increases in the other classes and grades of wheat.

The producers' prices for wheat in bags will therefore be as follows for the season 1947-48:—

	Class A.		Class B.		Class D.	
	s.	d.	s.	d.	s.	d.
Grade 1.....	41	6	41	0	38	0
Grade 2.....	40	10	40	4	37	4
Grade 3.....	39	4	38	10	35	10
Grade 4.....	—	—	36	2	33	2
Grade 5.....	—	—	33	1	30	1
Grade 6.....	—	—	29	5	26	5

These prices are f.o.r. producer's station and subject to an agent's commission of 9d. per bag in each case.

The higher price to the producer was granted in order to compensate producers for the increase in the production costs of wheat and also further to encourage the production of wheat.

Bread.—The price of wheaten bread for the present season remains unchanged at 6½d. per 29-oz. loaf delivered. The difference in the price of bread and the increased producers' price of wheat will be contributed by the Government in the form of a further subsidy.

In view of the large local rye crop, it has been found possible to reduce the price of rye bread by 2½d. per loaf. In the case of first-grade rye bread, the price will be 10½d. per 32-oz. loaf as from 1 November 1947, as against 13½d. last year.

Rye, Oats and Barley.—The basic producers' price of rye for the season 1947-48 was also increased by 6d. per bag. for all grades in agreement with wheat prices, while the producers' prices for all the classes and grades of oats and barley were reduced all round by 3d. per bag. The Government decided that reserve funds should be instituted for barley and oats respectively, which should be administered by the Wheat Control Board and used for the improvement of production, processing or marketing or encouragement of the local consumption of barley and oats and their products. For this reason it was decided that an amount of 6d. per bag should be collected on all barley and oats produced locally that are bought and sold by the Wheat Control Board during the season 1947-48. This amount will then be paid into the barley and oats reserve funds. An amount of 3d. per bag will then be subtracted from the producers' prices of the different classes and grades of oats and

CROPS AND MARKETS.

barley as announced in a press statement issued on 9 May 1947, while 3d. per bag will be added to the selling prices in order so to collect 6d. per bag.

The producers' prices for the different grades and classes of these winter cereals will therefore be as follows for the season 1947-48:—

<i>Rye</i> :—		s.	d.						
Grade 1.....	27	6							
Grade 2.....	27	0							
Grade 3.....	25	6							
<i>Barley</i> :—	<i>Class A.</i>			<i>Class B.</i>		<i>Class C.</i>	<i>Class D.</i>		
	s.	d.		s.	d.	s.	d.		
Grade 1.....	24	9		23	9	15	3	29	9
Grade 2.....	23	3		22	3	14	9	28	9
Grade 3.....	22	3		21	9	13	9	27	3
<i>Oats</i> :—	<i>Class A.</i>			<i>Class B.</i>					
	s.	d.		s.	d.				
Grade 1.....	15	9		15	3				
Grade 2.....	15	3		14	9				
Grade 3.....	—			13	9				

The above prices are f.o.r. per bag of 150 lb. except in the case of rye and class D barley where the price is per bag of 200 lb.

(For further particulars see *Government Gazette Extraordinary* of 31 October 1947).

Dairy Produce Prices for the Season, 1947/48.

Fresh Milk.—The Union's nine large urban areas now consume nearly sixty million gallons of fresh milk per annum, which is more than double the pre-war consumption. As the increased supply had to be obtained in the face of the rapidly rising costs of labour and of feedstuffs, which were scarce and of poor quality, fresh-milk prices necessarily had to be increased under these circumstances. Indeed, in order to stimulate production sufficiently, the higher cost level of the milk suppliers within a short distance of the cities had to be taken as the basis in fixing producers' prices. In view of the increased supplies and improved quality of feedstuffs and the surpluses of fresh milk that have made their appearance in almost all centres in recent months, the Government considers that this basis is now no longer warranted.

The Government has accordingly decided to reduce the price of milk to producers by 2d. a gallon, and the wholesale and retail prices correspondingly (at the rate of $\frac{1}{4}$ d. a pint), in the Witwatersrand-Pretoria area, Durban, Pietermaritzburg, Port Elizabeth and East London. For the present, milk prices will remain unchanged in Cape Town and Kimberley, where supplies are less plentiful. The position at Bloemfontein is still under consideration. In view of the improved supply position, price control measures for fresh milk have been withdrawn altogether in all the smaller centres.

Butterfat and Condensing Milk.—The prices of industrial milk as fixed in November 1945 were based on the results of an investigation into the costs of production of industrial milk, covering the season 1944-45. Production costs have continued to increase since then, while production has declined.

Butterfat and condensing milk supplies have shown a declining tendency with present price relationships. For instance, creamery butter accounted for over 80 per cent. of the total industrial milk

intake in 1939, but accounts for under 75 per cent. at present, and the output of condensed milk has fallen in even a greater ratio. Since it is necessary to restore the balance, the Government decided to adjust butterfat and condensing milk prices suitably. The basic producers' prices of butterfat have therefore been increased all round by 3d. per lb. for all grades as from 1 November 1947, viz. to 2s. 5d., 2s. 3d. and 2s. 1d. per lb. for 1st, 2nd and 3rd grade butterfat, respectively.

The producers' prices for condensing milk (other than milk for skimmed-milk powder which remains unchanged at last year's level) were therefore also increased by 1d. per gallon on the recommendation of the Dairy Board as from 1 November 1947, viz. from 12½d. to 13½d. per gallon.

Cheese-milk.—On the basis of the actual increase in production costs, the basic producers' prices of cheese-milk were increased by ½d. per gallon as from 1 November 1947, viz. from 11½d. to 11¾d. per gallon.

Butter and Cheese Prices.—The Government was, however, not willing to increase the wholesale and retail prices of creamery butter considerably. In order to cover the increased costs of production and the higher prices paid for butterfat, the Government will, however, augment its subsidy expenditure on butter to £400,000 (representing 3d. per lb. of butter) so that the retail price of butter need be raised by 1d. only to 2s. 6d. per lb. for 1st grade. The maximum wholesale and retail prices of creamery butter are therefore as follows as from 1 November 1947:—

Wholesale prices 2s. 4d., 2s. 2d. and 2s. per lb. for 1st, 2nd and 3rd grade butter, respectively, and retail prices 2s. 6d., 2s. 4d. and 2s. 2d. per lb., respectively.

As a result of the ½d. increase in the producers' price for cheese-milk, the wholesale and retail prices of the Cheddar and Gouda types of cheese have also been increased all round by ½d. per lb. for each grade. The wholesale and retail prices of cheese are therefore as follows as from 1 November 1947:—

Cheddar, wholesale.—1s. 7½d., 1s. 6½d. and 1s. 4½d. per lb. for 1st, 2nd and 3rd grade, respectively for quantities of 12 lb. and more; and

retail.—1s. 10½d., 1s. 9½d. and 1s. 7½d. per lb.

Gouda, wholesale.—1s. 7½d. for 1st grade; and

retail.—1s. 10½d. for 1st grade.

Winter Premiums.—The same winter premiums as were paid last season will again be paid on butterfat and cheese-milk, viz. 4d. per lb. butterfat and 2d. per gallon cheese-milk during June; and 6d. per lb. butterfat and 2½d. per gallon cheese-milk as from July until October.

(For further particulars see *Government Gazette Extraordinary* of 31 October 1947.)

Index of Prices of Field Crops and Pastoral Products.

THIS index, as shown elsewhere in this issue, remained unchanged for October, 1947, viz., at 218.

The most important changes occurred in the following groups:—

(a) "Hay" decreased from 184 to 151 due to a decrease in the prices of lucerne and teff.

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